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पुस्तकालय

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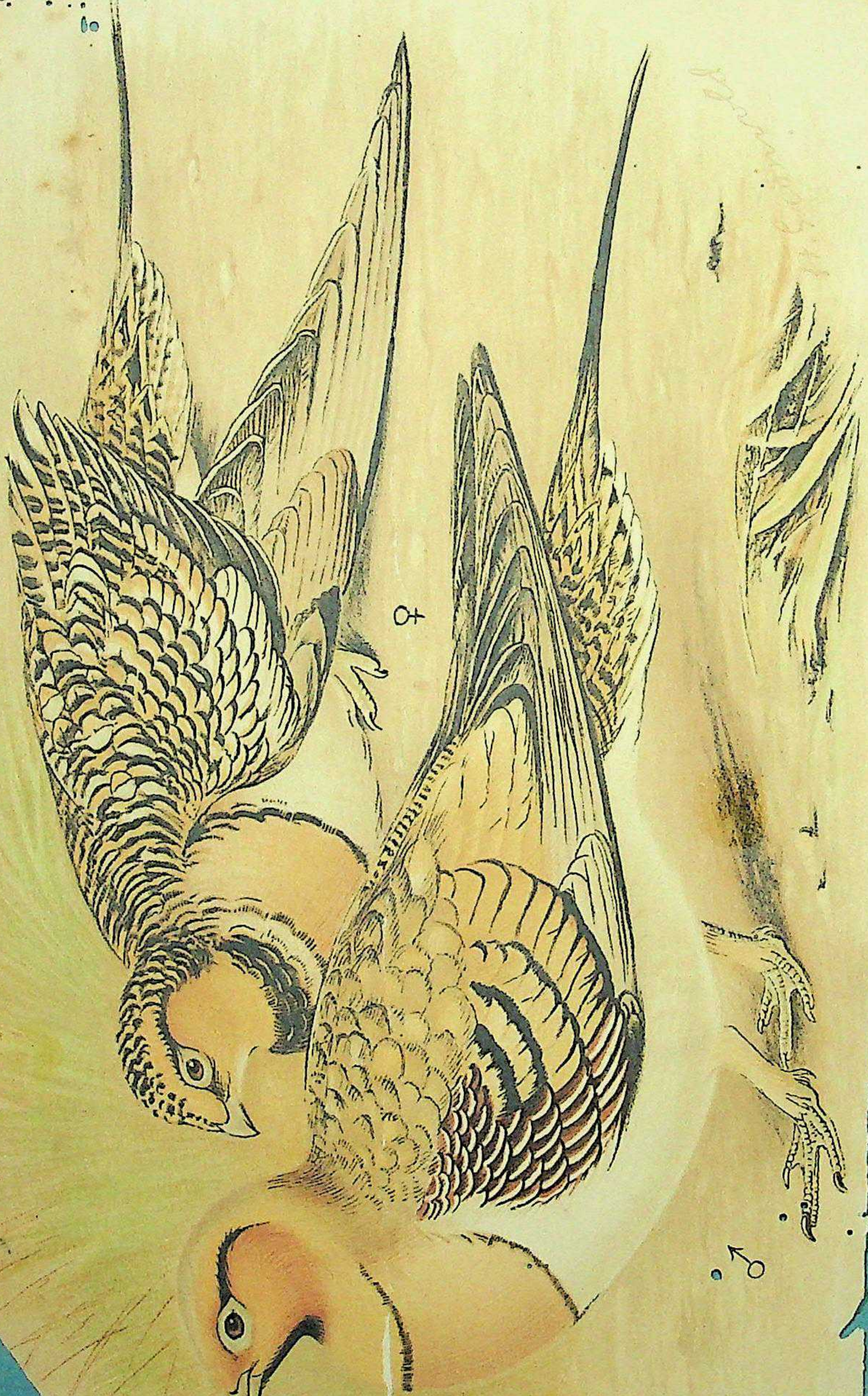

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# THE GAME BIRDS OF INDIA, BURMA AND CEYLON.

BY

E. C. STUART BAKER, F.L.S., F.Z.S., M.B.O.U.

## PART XIII.

*With Plate XIII.*

(*Continued from page 657 of Volume XXII.*)

### Genus *PTEROCLURUS*.

The Genus *Pteroclurus* is, as I have already said, scarcely worthy of division from *Pterocles*, the only difference being that the central tail feathers of the former genus are produced in long filaments beyond the other rectrices, whilst those of the latter are normal.

There are altogether four species in this genus of which the first, *P. alchata*, is divided into two sub-species. Three species are found in India, of which one, *exustus*, is a permanent resident, one, *alchata* is, practically, if not wholly, migratory, and the third, *senegallus* very rarely breeds within Indian limits.

### KEY TO THE SPECIES.

*A.* Lower plumage from breast pure white ... *alchata*.
*B.* Lower plumage marked with black.
  $a^1$. Middle of abdomen barred black and rufous ... ... ... ... *exustus*. ♀
  $b^1$. Middle of abdomen black.
    $a^2$. Black gorget across breast ... *exustus*. ♂
    $b^2$. No black gorget across breast ... *senegallus*.

## PTEROCLURUS ALCHATA.

### (Sub-species—CAUDACUTA.)

### *The Large Pin-tailed Sand-Grouse.*

*Tetrao alchata.*—Linn. Syst. Nat. i, p. 276 (1766), xii, Edit.

*Tetrao caudacutus.*—S. G. Gmel Reise, iii, p. 93 (1774).

*Pterocles alchata.*—Blyth, Cat. B. As. Soc., p. 249; Jerdon, B. of Ind. iii, p. 500; Hume Str. Feath, i, p. 221; Blewitt, *ibid*, iii, p. 268; Hume, Cat. No. 801; Blanford, E. Persia, ii, p. 271; Hume, Str. Feath. vii, p. 161; Hume and Marsh. Game B. i, p. 77; Butler, Cat. B. of Sind, p. 53; Barnes, B. of Bom., p. 297; *id.* Str. Feath. ix, p. 458. Le Mess, Game-B., p. 58; Oates, Game B. i, p. 23; Bogle, Jour. B. N. H. S. xii, p. 529; Nurse, *ibid*, xiv, p. 388.

*Pteroclurus alchata.*—Ogilvie-Grant, Cat. B. M. xxii, p. 7; Blanford, Avi. India, iv, p. 58.

*Pteroclidurus alchata.*—Sharpe, Hand-l. i, p. 50; Oates, Cat. Eggs B. M. xi, p. 75.

*Vernacular names.*—None recorded.

*Description, Adult male.*—Centre of crown and nape grey, more or less tinged with ochreous, forehead, lores, sides of head rich rufous buff shading into ochreous on the neck all round. Chin and throat black and a narrow line of the same running from behind the eye nearly as far as the nape. On the back the ochre of the neck merges into olive ochre, a few of the feathers here and most of the scapulars with a yellow subterminal spot and all margined with grey; lower back and rump yellow buff barred with black, upper tail coverts even more yellow and the bars forming arrow heads on the longest. Tail barred blackish and buff at the base, becoming dark olive ochre at the tip and almost black on the prolonged portion, the outer tail feathers are tipped yellow and subtipped dark blackish. Lesser median and secondary coverts white with broad bands of bright chestnut chocolate near the tips and with black edges; shoulder of wing, bastard wing, primary coverts and primaries grey, the last named darker on the inner webs and margined white, the outer web of the first primary and all the shafts black; outer secondaries blackish brown, and bases white and edged with same; innermost secondaries like the scapulars; secondary coverts, where visible, yellow-ochre with blackish chocolate terminal bands. Breast pale pinkish rufous divided from the yellow ochre of the neck and the white of the lower breast and abdomen by narrow black bands; flanks axillaries, lesser and median under wing coverts, and under tail coverts white; under shoulder and edge of wing dark grey, greater under wing coverts pale grey.

When once fully adult the males do not vary much in tone of colouration but the number and size of the yellow spots on the scapulars and adjoining parts do vary to a considerable degree and when these are unusually numerous they give a very bright boldly coloured appearance to these parts and, on the contrary, give a dull rather dark appearance when they are few and small.

Below, the rufous breast band varies a little in intensity and in the amount of pink, otherwise the lower parts are very constant.

*Measurements.*—Wing 7·98″ (213·6mm.) to 8·40″ (224·2mm.) with an average of 8·25″ (220·8mm.); tarsus 1·00″ to 1·12″ (25· to 28·5mm.) and averaging over 1·06″ (26·75mm.); bill at front ·50″ to ·58″ (12·5 to 14·6mm.) and averaging rather over ·53 (13·5mm.); the tail varies from about 5·50″ (140mm.) to 7·50″ (190·5 mm.).

These measurements are taken from a series of over a hundred skins, the very great majority of these being birds shot in India. They include the series in the British Museum and in the Tring Museum.

"*Males.*—14 to 15·5; expanse 24 to 26; 7·96 to 8·5; tail from vent 5 to 7; tarsus 1·0 to 1·13; weight 10 to 12 ozs." (Hume.)

"The feet are dirty or dusky green, in one specimen yellowish; the irides are brown; the bill varies in colour somewhat and I have recorded it in different specimens, as dusky green, greenish brown, brown, dark brown, slate colour." (Hume.)

*Adult female.*—Whole upper parts from forehead to tail buff barred black, on the shoulders and interscapulary region the tint is often somewhat rufous and that on the upper tail coverts brighter and more yellow. On the interscapulary feathers a few of the broadest bars of black have their centres grey. A short supercilium, lores and edge of forehead, sides of head and the neck rufous like those parts in the male but paler and duller; chin and throat white in the centre; a fairly well defined black line from behind the eye. Scapulars and innermost secondaries like the back, but the bars wider and bolder and with more grey and with the ends yellow ochre narrowly edge with black. Primaries and their coverts like those of the male. Secondary, greater and median coverts white with rufous subterminal bands and black edges, the bases, where covered, barred rufous and black; outer secondary covers and median primary coverts with broad white terminal bars edged black. Below the rufous of the fore neck there is a wide collar of black followed by a narrow fringe of the same colour as the neck, which merges into grey and is then followed by another narrow band of black. From this band the colours are as in the male, a broad band of rufous, a narrow band of black or very deep chocolate and the rest white.

The females, when adult, differ to much the same extent as the male underneath, but above the range of variations is considerably greater, some birds being much more boldly and richly marked than others and the amount of yellow markings and the extent to which the slate grey bars take the place of the black on the scapulars and the dorsal region is variable.

*Measurements.*—Wing 7·65″ ( 184 mm. to 8·30″ ) ( 206·6 mm.) with an average of 7·99″ ( 196·3mm.); tarsus about ·97″ ( 24·5 mm. ) and bill at front about ·49″ ( 12·6 ). The tail averages a good deal shorter than the male, the longest I have seen being 6·2″ ( 157·2) whilst many are well under 5·″ ( 127 mm. ).

" *Females.*—Length 13·5 to 15 ; expanse 24 to 25 ; wings 7·5 to 8·15 ; tail from vent 3·75 to 6 ; tarsus 0·97 to 1·12. Weight 8·25 to 11·25 ozs." (Hume.)

The colours of the soft parts are the same as in the male.

*Immature male.*—In males not yet fully adult much of the barring of the upper parts as in the female is still retained, the head is wholly barred, the chin and throat white and the fore neck dull olive buff with large black spots. The black of the throat is acquired in patches, and finally the well marked crown, etc. of the adult male, though birds, otherwise fully adult, may be found with a few barred feathers on the upper head.

*Plumage of young female.*—Chin and throat white ; whole upper surface barred buff and blackish; duller on the dorsal parts, brighter on rump and tail; wings with the white on the coverts replaced with grey, the slate grey bands replaced by black, and the whole tone duller and greyer. The sides of the head, neck and breast are dull earthy buff with bars of black, these bars are rather denser on the base of the throat and above the white of the abdomen, giving slight indications of the bands on these parts ; the under tail coverts are white with a few brown bars and the rest of the under parts white as in the adult, but with obsolete brown bars here and there, especially in the centre of the abdomen.

*First plumage of both male and female.*—Whole upper parts, head, neck and breast dull buff, barred with blackish and brownish black above and dull brown below. Chin and throat white as in the older female. The bars on the head and lower parts are narrower and more numerous than in the older bird, and are more crescentic in shape. The quills are paler and the inner primaries freckled with rufous towards the tip. The wing of the bird of this description measures 7·02″.

The nestling of this extremely common and widespread species does not, curiously enough, appear to have been yet described.

Mr. Meade Waldo was the first to discover that the male of this Sand-Grouse assumes a post nuptial plumage after the young are hatched, much in the same manner as many ducks do. He says " Roughly there is the first nestling plumage which is assumed from the down. This is moulted in the autumn into the winter plumage. In the very early spring this again is changed into the breeding plumage, and the cock in late summer puts on an eclipse dress resembling the hen, except the slate blue bars on the back are missing. As far as I can ascertain these changes are brought about by a complete renewal of feather and all are complete, but the eclipse plumage is only perfect in adult and vigorous birds, otherwise the feathers that are first shed partake of the character of breeding plumage and eclipse and those last moulted of eclipse and winter plumage."

There are two sub-species of this Sand-Grouse which are very closely allied, *viz.*, those referred to in the Catalogue of Birds as *Pteroclurus alchata* and *Pteroclurus pyrenaica*, and before dealing with the distribution of these two forms, which will have to be considerably revised, it will be first necessary to dispose of the question of the names under which these two forms should be known.

The name *pyrenaica* was first given in 1760 by Brisson, to a bird from the Pyrenees, which in his " Ornithology" I, p. 195, he called *Bonasa pyrenaica*. Brisson's names are not, however, accepted in Ornithology unless adopted by Linnaeus, and in this particular case Linnaeus discards the name *pyrenaica* and renames the bird *alchata*.

This is in the 12th edition of his System Naturae, the first in which he mentions this species, though he refers to the genus *Bonasa* in the 10th edition. In the 12th edition he refers to this species as *Bonasa alchata* and states that its habitat is " Monspelir in Pyrenoeis, Syria, Arabia," the bird, therefore, is undoubtedly the same as that named *pyrenaica* by Brisson, which is the Spanish bird and Linnaeus merely adds Arabia and Syria to its habitat. Gessner, it should be noted (Avi. 311-307) describes his bird *alchata* as European, giving Italian, German and French names for it, he could not, therefore, have been referring either to Asiatic or African specimens, any more than Brisson did.

Under these circumstances the sub-species referred to as *pyrenaica* in the " Catalogue of Birds " cannot bear that name and will have to stand as *Pterocluras alchata alchata* (Linn.) and another name must be found for the Asiatic sub-species. The one having priority and, therefore applicable, seems to be *caudacutus* given by Gmelin, in 1774, to the form found in Southern Russia (S. G. Gmelin, Reisa, iii, p. 93, pl. xviii, 1774) for the South Russian bird is the same as that found in Asia Minor, Palestine, etc., and these again are the same as our Indian birds.

Accordingly, the two forms will stand as follows : *Pterocluras alchata alchata* for that sub-species found in Spain, etc. and *Pt. alchata caudacuta* (Gmelin) for the sub-species found in Asia, etc.

Russian ornithologists have divided this Sand Grouse into two further sub-species, naming the bird from South Persia, Afghanistan and Baluchistan (and of course India) *Pterocluras alchata* *bogdanowi* and that from Northern Persia *Pt. a. severtzowi* but I cannot myself see that the birds from these areas vary in any way.

It would certainly be easy to select 10 birds from South Persia and adjoining countries, 10 others from Trans Caucasia and Trans Caspia, and yet 10 others from South Russia and shew each series to be quite separate; but it would then be equally easy to take 10 birds from each area and to shew in each series specimens of every type.

*Distribution.*—For a long time, possibly owing to the paucity of material available for comparison, it was considered that the form of this Sand-Grouse found in Northern Africa was the same as that found in South-Western Europe; but Whitaker, in his "Birds of Tunisia" pointed out that, strange to say, the bird in Northern Africa was not the same as his cousin just across the water in Southern West Europe, but was the same as that found to the East in Western Asia.

The British Museum has a magnificent series of both Asiatic and Spanish birds, but is very badly off for African specimens. This link is supplied by the collection in the Tring museum, where we have 7 specimens from Tunis and 2 from Morocco, with other specimens from Palestine, Lenkoran (Trans Caucasia), Merv (Trans Caspia), Bokhara and East Persia and South Russian Steppes.

These are all, obviously, the same sub-species and they are, equally obviously, different from birds taken in Spain and France, which are brighter above, owing to the large amount of yellow marking, and are also more richly and darkly coloured below.

The area of distribution of our Indian bird, therefore, extends from the North-West of India, through Baluchistan, Afghanistan and Persia, across the Caspian Sea and the Caucasus Mountains into the South Russian Steppes and throughout Eastern Asia Minor and again, due West through Southern Persia and Arabia into Northern Africa, through Abyssinia, Nubia, Egypt, the Sahara and as far West as Morocco.

The Spanish form, on the other hand, is confined to Portugal, Spain and France, where it is common, and straggles into Italy, Germany and Greece. Whether the bird which has been obtained in Cyprus and Malta belongs to the African or West European form there is nothing on record to shew.

I have seen but few French skins, but Paul Paris in his "Oiseaux de France" records that this is a common resident, nesting regularly in that country.

Within Indian limits the Large Pin-tailed Sand-Grouse occurs in enormous numbers in the North West and Sind in the Trans Indus country; in great numbers also, in the Punjab, between the Indus and the Chenab, after which it becomes less common towards the Gara and the Beas, though still constantly and regularly met with, from here it extends throughout the Punjab, having been found in Ludhiana, and Delhi in the extreme East. To the South, Hume obtained it as far South as Sambhar in Rajputana, and I have notices of its occurrence from Jodhpur and Bikanir, and Major C. G. Nurse, in 1902, recorded it from Deesa still further South than it had been previously obtained. This last bird was shot by Captain L. Oldfield, R. F. A., who obtained one specimen out of a flock of 20 or 25 birds.

When in India it assembles in enormous flocks, literally in thousands, and in the more Eastern portion of its habitat this seems to be generally the case, indeed some people consider this Sand-Grouse to have been the Quail provided for the Israelites; further West, however, it does not seem to collect in nearly such large flocks.

Hume is the only writer who has given us an account of this bird's habits in India and his remarks are to the following effect. "I have seen very little of this species myself, and only on a vast plain some miles from Hoti Mardan, where during the winter, they were in tens of thousands. This plain is partly barren, partly fallow, and partly cultivated with wheat, mustard, and the like. It was only on the barren and fallow land that I saw them. They are extremely wary, and it was only by creeping up a nala or small ravine that it was possible to get within even a long shot at them. Their flight is extremely rapid and powerful, to me it seemed more so than of any of their congeners.

"They are very noisy birds, and whether seated or flying, continually utter their peculiar cry, which, though somewhat of the same character as that of *arenarius*, is unmistakably distinct from the call note of any of the other species.

"Those I shot, and, according to their account, most of the large series previously shot by my collectors, had fed entirely on green leaves, seeds, small pulse, and grain of different kinds. The gizzards contained quantities of small stones. There were several pools and places where the rain floods had not quite dried up, on the plain I have referred to, and the birds seemed to sit about much in their immediate neighbourhood.

"One or two of my birds were very fat, so much so that it was difficult to skin them, but as a rule, when cooked they were as dry and tasteless as the rest of the Sand-Grouse.

"I was told that they were occasionally hawked with Shaheens, but their flight is so rapid and powerful that I should doubt much sport being obtained this way. I was also told that they could be shot by working a couple of Peregrines over them, when they allow a very close approach and almost refuse to rise."

This account agrees well with Whitaker's account of these birds in Tunis as seen by him at one of their favourite watering places.

He says "In many of its habits the Pin-tailed Sand-Grouse resembles the preceding species (*P. arenarius*) though differing in others. It is, as a rule, found in much larger flocks than *P. arenarius* and is said never to approach the sea-coast. Like that bird, however, it is very wild and shy and when disturbed, generally flies for a great distance before settling down again, although should it be its hour for drinking, and its thirst not yet be appeased, it will often make one or two attempts to return to the water before finally leaving the spot.

"Such of the *Oueds* as may still have some water in them in spring, or even the holes scooped out of the river beds by the Arabs for the purpose of providing themselves and their flocks with water are sure to be visited by Sand-Grouse for drinking, and it was once my good fortune to see no less than three alternative species of these birds frequenting one of these spots at the same time, and to witness flock after flock of each come down to the water during the hour or two the flight lasted.

"*P. arenarius* and *P. alchata* were well represented on this occasion and about equally numerous, as shewn by specimens obtained of both, but a third species was also present, of which I failed to secure an example, but which judging from its appearance, on the wing, appeared to be *P. coronatus*.

"The morning flight of Sand-Grouse for the purpose of drinking commences soon after sunrise, and is generally continued for an hour or two, or until the sun is well up when it entirely ceases. During the time the flight lasts the spot visited by the birds, particularly should it be one where water is abundant, presents a most animated scene, the air being full of small flocks hurrying to and from and the sandy banks, and the sandy parts of the river bed being in some places thickly covered with them, while the chorus formed of many hundreds of clamourous bird voices creates quite a babel of sound.

"The food of this species consists chiefly of the seeds and tender parts of various desert plants. Its note is a ringing *catarr* or *guettarr*."

In the Zoologist of 1896, p. 299, and the "Field" of August 1896 Mr. Meade Waldo first gave an account of the breeding of *Pterocلurus alchata* in confinement and described how the male, after the young were hatched, would "rub the breast violently up and down on the ground, a motion quite distinct from dusting, and when all awry would get into his drinking water and saturate the feathers of his under parts. When soaked he would go through the motions of flying away, nodding his head, etc. Then, remembering his family was close by, would run up to the hen, make a demonstration, when the young would run out, get under him and suck the water from his breast."

In a longer account in the Avicultural Magazine for 1906, p. 219, Mr. Meade Waldo gave yet further details of this curious habit, as well as other most interesting details. He writes "Incubation lasts from twenty-one to twenty-three days: the hen sits by day, the cock taking her place by night, usually going on the eggs about 5 p. m.; three eggs are a full clutch. The young when hatched quickly become independent, and about the 10th day separate at night, roosting away from their parents, and as far as possible from each other, not settling down to their final roosting place until it is almost dark. Both parents brood the young when they are very small."

"The extraordinary method employed by the parent male Sand-Grouse of conveying water to their young by saturating the feathers of their breasts, was first described by me in 1896, and since by Mr. St. Quentin in his interesting account of the successful rearing of the Lesser Pin-tailed Sand-Grouse, *P. exustus*. I have had the good fortune to see the males of *Pterocles arenarius*, the Black-breasted Sand-Grouse and *Pteroclurus alchata*, the Greater Pin-tailed Sand-Grouse getting water for their young in a wild state, but, had I not seen it administered in confinement, would have considered them to have been demented birds trying to dust in mud and water, when unlimited dusting ground surrounded them on every side.

"In very waterless districts, where the only water procurable was from deep wells situated at great distances from one another, this method of procuring water must be most precarious, for I saw *P. arenarius* waiting by the wells and going to the muddy spot where the skins used to be laid before being loaded on to the camels, and where the water was slopped over from the troughs where the animals drank. I also saw them fly over the prickly Zareba surrounding the tent-villages and go to where there was a soft spot for the same purpose. I did "(not?)" see *P. alchatus* actually soaking themselves, they were much wilder, and also in less arid places, but I repeatedly saw cocks pass over, their white breasts soaked in mud and water."

A further interesting note in the Avicultural Magazine for February 1910 by the same writer describes how he kept a female bird of this species in confinement for 17 years, so that she must have been at least 18 years old at the time of her death. She bred regularly year after year from 1893 to 1906, and generally succeeded in bringing up her young. Mr. Meade Waldo tells us that with other food, he gave her as much hemp seed and maw seed as she liked, and that the latter was her favourite seed.

*Pteroclurus alchata* does not regularly breed with us in India, though it has done so on rare occasions and may, quite possibly, be often found to do so; otherwise it breeds in suitable localities throughout its range.

The first egg of this species taken in India is one now in the British Museum, which was found at Jhimpir in Sind on the 10th July, 1878. After this, nothing else was recorded until Mr. Bogle wrote the following interesting note to the B. N. H. S. Journal, which I quote in extenso, merely noting that it was written from Mardan in the Punjab. "I cannot see, either in Oates, Jerdon, or Hume and Marshall any record of the Eastern Pin-tailed Sand-Grouse, *Pterocles alchatus* breeding in India, which I think I may claim to have proved breeds in the Peshawar Valley. Two days ago, eggs were brought to me by a man, who declared one was that of the Common and the other that of the Pin-tailed Sand-Grouse. Doubting his word I made arrangements to go out this morning, 10th June 1900, with him, and see if I could gather any information myself. I first went to the place where these Sand-Grouse water, where I found, close to a small village called "Kasim" the Common Sand-Grouse flighting in packs and a very few pairs, while to my surprise the Pin-tails all came in pairs (I saw five or six pairs). I shot one pair of the latter and then proceeded to search a few miles further on in a vast open plain for nests. I found only two nests, each containing three eggs of the Common Sand-Grouse. In each case I approached so close to the bird in the nest that there was no necessity to shoot it in order to identify it. On my return I dissected the female Pin-tailed Sand-Grouse and found an egg inside quite ready for laying, and I have no doubt that it would have been laid to-day in the same plain I was searching in had the bird lived."

"I regret to say the egg was broken badly, first pierced by shot and again broken in extraction."

According to Canon Tristram, writing of this bird's habits in North Africa. "Its breeding habits are exactly like those of *P. arenarius*, but its egg is of a much richer fawn coloured tint, covered and sometimes zoned, with large maroon red blotches, while that of the other is of a paler hue, with obsolete pale brown blotches."

Salvin describes these birds as breeding in the Atlas, and says "The extensive sandy plains termed the Harakta, of which El. Korarf is one of the largest, are the only localities in which we met with the Sand-Grouse. It makes no nest but scrapes a slight hollow in the sand, in which it deposits its three eggs. These are laid in May, the young being hatched about the second week in June."

The eggs of this Sand-Grouse and of the other sub-species *Pt. alchata typica* differ from all other Sand-Grouse eggs in the richness of their colouration. Normally the ground colour is a rich clear buff, though in a few eggs it is a paler and more cream or bright stone-yellow in colour. The superior markings consist of well defined blotches and spots with a few specks of rich vandyke brown, here and there being one or two with a chocolate or deep maroon tint, the secondary are similar in size and shape, but are lavender grey and neutral tint in colour, some quite dark.

The surface is fine and smooth with a strong gloss and the shape is the normal elliptical one of all Sand-Grouse. They vary very greatly in size, more so I think than the eggs of any other Sand-Grouse do. The eggs recorded in the British Museum Catalogue taken from Northern Africa and included under the species *Pteroclidurus* belong, as I have already said, to the Indian form. These eggs vary from 1·65″ to 1·96″ in length and from 1·15″ to 1·3″ in breadth. I have no egg which does not come between the extremes of length given here, but I have one which is only 1·11″ (28·3 mm.) in breadth. The average of 28 eggs in my collection is 1·83″ × 1·18″ (26·5 × 30·0 mm.).

## PTEROCLURUS EXUSTUS.

### *The Common Sand-Grouse.*

*Pterocles exustus.*—Temm. Pl. Col. v, Nos. 354 and 360 (1825); Blyth. Cat. B. As. Soc., p. 249; Gould, B. of Asia, vi; Jerdon, B. of Ind. iii, p. 502; Blanford, Geol. and Faun. Abyss, p. 419; *id.* J. A. S. B., xxxviii, pt. ii, p. 189; McMaster, *ibid*, xl., pt. ii, p. 214; Stoliczka, *ibid*, xli, pt. ii, p. 249; Hume, Str. Feath. i, p. 225; Adam, *ibid*, p. 392; Hume, Nests and Eggs, p. 513; King, Str. Feath. ii, p. 458; Butler, *ibid*, iv., p. 4; Fairbank, *ibid*, p. 262; Hume and Marsh., Game-B. i, p. 69; Hume, Str. Feath. vii, p. 161, Ball, *ibid*, p. 225; Doig, *ibid*, viii, p. 371; Mc Inroy, *ibid*, p. 492; Hume, Cat., No. 802; Butler, Cat. B. of Sind, etc., p. 53; *id.* Cat. B. S. Bombay, p. 67; *id*, Str. Feath. ix, p. 421; Reid, *ibid*, x, p. 61; Davidson, *ibid*, p. 316; Barnes, B. of Bombay, p. 300; *id.* Jour. B. N. H. Soc. i., p. 55; *id. ibid*, v., p. 336; Oates, Humes Nests and Eggs, 2nd Edit., p. 361; Newnham, Jour. B. N. H. Soc. vi, p. 94; Nurse, *ibid*, xiv, p. 172.

*Pteroclurus exustus.*—Ball, Str. Feath. ii, p. 426; Ogilvie-Grant, Cat. B. M., xxii, p. 12; Oates, Game B. of Ind. i., p. 26; Blanford, Avifauna, Ind., iv., p. 60; Ogilvie-Grant, Game-B. i., p. 12; Le Mess., Game-B., 4th Edit., p. 58.

*Pterocidurus exustus.*—Sharpe, Hand-Bl. i, p. 50; Oates, Cat. Eggs, B. M. I, p. 77.

*Vernacular names.*—Bhat-titur, Bakht-titur, Kumar-tit Kakar, Dangar Rowrie (H.); Butabur, Batibun (*Sind*); Popandi (*Bhil*); Pakorade (Mahr); Jam polanka (Tel); Kal-Gorjal-Haki; (*Can. Mysore*); Kal-handari (Tamil.)

*Description, Adult male.*—Crown to rump and upper tail coverts isabelline-grey to isabelline-brown, generally darkest on the tail coverts and palest on the crown; lores, cheeks, chin and throat dull yellow ochre, often tinged with orange buff, this colour extending round to the back of the nape forming an indistinct collar, which shades off into the other parts. Scapulars and sometimes the feathers of the inter-scapulary region the same as the rest of the back but darker and changing into ochreous-buff, or buff, at the ends which are margined with brown at the tips. Inner lesser coverts like the back gradually changing to buff, or ochreous, on the other lesser, median and inner greater coverts which are margined with brown; greater secondary coverts and inner secondaries buff, or ochreous-buff, the latter shaded with olive on the inner web and inside of the outer web. Edge of shoulder of wing, bastard wing, primary coverts and primaries dark brown, the five inner primaries with broad oblique bands of white at the end; outer secondaries brown.

The yellow ochre of the throat and fore-neck changes into vinous buff on the upper breast which is divided from the lower breast by a narrow band of black, above which is an indefinite and still more narrow band of white, caused by the white of the black tipped feather showing through; lower breast dull yellow-buff changing gradually into the chocolate of the rest of the lower plumage and flanks, which itself becomes black in the centre of the abdomen; feathers of the tarsus and under tail-coverts creamy buff; Central tail feathers like the back darkening towards the narrow prolonged portions which are quite black at the ends, the other rectrices are tipped with pale buff and the outermost also mottled with dark rufous next this pale tip.

On the upper plumage the colour shows most variations on the wings where it runs from a beautiful pale vinous buff of cream dove colour, to a bright chrome yellow. In the great majority of birds the general tone is a vinaceous buff, with sandy yellow predominating on the softer feathers of the wing.

The amount of black on the abdomen also differs greatly in different individuals but African birds, on an average, seem darker and more richly coloured here than are Indian specimens.

The yellow of the throat varies from pale, rather dull chrome yellow, to a bright almost deep chrome.

"In this species the males average rather larger and heavier and have decidedly longer tails. The following is a resumè of many measurements accorded in the flesh:—

"*Males.*—Length 11·75 to 13·75; expanse 21·13 to 22·5; wing 6·7 to 7·5; tail from vent 4·38 to 5·87; tarsus 0·9 to 1·0; bill from gape ·62 to ·7 per cent. Weight 8 to nearly 10 ozs." (Hume.)

To the above I may add a few average measurements taken from the *made up skins* of over 100 specimens. Wing 7·15″ (190 mm.); bill at front, from tip to feathers on forehead ·52″ (13·6 mm.).

*Colours of soft parts.*—"The feet and bill vary from pale slaty grey to pale plumbeous, or lavender blue; the irides are dark brown and the orbital skin pale lemon yellow to pale yellowish green." (Hume).

*Adult female.*—Whole of upper plumage rather dull buff, sometimes sandy buff, sometime vinaceous and sometimes with here and there a slightly rufescent tinge; the feathers of the crown and nape are marked with central longitudinal spots of dark brown which form regular streaks, on the hind neck, the spots widen into blotches and on the upper back become broad bars, the centre wider and pointed; the feathers of the rest of the upper parts are barred; scapulars, innermost secondaries and lesser and median coverts like the back but the feathers broadly tipped with buff and some of the coverts very finely edged with reddish brown; remainder of wing like the male but with fewer reddish bars on the median coverts. Chin, lores, supercilia, sides of the head and throat yellow ochre, the sides of the head speckled with blackish brown, these spots increasing in size on the neck and breast which is like the back, but generally with a stronger vinaceous tint; the chin and throat are immaculate in old birds, but the ear coverts have fine black hair marks. Most females have a faint indication of a very dark brown line separating the upper breast from the lower, which is a dull pale ochre-buff; abdomen, flanks and feathers of vent rufous buff closely barred with very dark brown, under tail coverts creamy buff. Tail feathers like those of the male; axillaries and under aspect of wing brown, the smaller coverts and shoulder barred with dull buff.

As already shewn above the birds grade in general tone from a sandy buff to a dull vinaceous buff above and on the under plumage they vary to much the same extent. The upper breast may be quite a dull, almost brown tint, whilst other birds are here quite a pale sandy buff; most birds will, however, be found intermediate. The light unspotted lower breast also varies in some degree, though not as much, I think, as the upper breast, and the abdomen and flanks also go through the same gradations of colours; but Western birds appear to be invariably darker than our Indian birds on these parts, although they seem no more richly coloured above. The colour of the throat and chin varies from very pale cream yellow to quite a rich, though light, chrome yellow."

"*Females.*—Length 11 to 12·25; expanse 20·9 to 21·5; wing 6·6 to 6·9; tail from vent 4·0 to 4·8; tarsus 0·8 to 0·85; tail from gape 0·6 to 0·67; weight 7·5 to 8·3 ozs." (Hume.)

The average wing measurements of about 100 females is 6·85″ (182·5 mm.) The extremes of length were, however, far greater than in Hume's series, ranging from 6·35″ to 7.05″ (170·5 to 187·5 mm.).

The colours of the soft parts are the same as in the male.

*An immature female* differs from the adult in having the outer primaries and inner secondaries tipped with buff, the former vermiculated with black, the upper breast spotted with blackish brown, the centre pair of tail feathers not produced with filaments." (Ogilvie-Grant.)

*A young bird with points of fluff* still about it, has the whole of the upper parts a pale dull buff and is finely vermiculated all over with tiny wavy bars of black, many of the feathers having the ends edged with white and with a chestnut patch at the tip. From chin to breast the colour is an earthy buff with fine bars of blackish and the abdomen and flanks are dull black. The quills are blackish brown, the trips freckled with buff and black, and the inner secondaries freckled thus all over; the greater and median primary coverts are also black, the former very narrowly, the latter broadly edged with dark buff.

*Another specimen older than the last* and with all the nestling fluff worn off is the same, but has a wide band below the breast and above the black abdomen almost devoid of spots and the breast instead of being vermiculated with narrow black bars has definite black spots; the inner secondaries are also more clearly and regularly barred with dull buff and deep brown, though the tips retain the same chestnut and black freckling. The tail is throughout banded earthy buff and black.

*Nestling in down.*—This is yet another of our common Indian Game Birds, the nestling of which still remains to be described.

*Distribution.*—*Pterocliurus exustus* extends throughout North West Africa and South-East Asia into India. In Africa it is common, in South Egypt, Nubia, Abyssinia, and extends into Somali, North Egypt and West as far as Algeria and South into British and German East Africa. East it works through Arabia from the extreme South to the extreme North through Palestine and Arabia Petroid, South Persia into India.

Within India it occurs practically over the whole continent in suitable places and Hume thus defines its habitat. "Throughout India proper, where the rainfall is moderate, the soil fairly dry and the country open and tolerably level, the Common Sand-Grouse abounds. Towards the East and South its general distribution is much that of the Painted Sand Grouse, though the particular localities it affects are different; but it is a Western form which extends into India and not a purely Indian form, and it is common in places (for instance in Sind) to which P. *fasciatus* does not extend.

"It is a bird of the level, sparsely wooded, sandy countries *par excellence*, and though it may be shot in sundry plains *close* to hills in Rajputana, unlike the Painted Sand-Grouse, it eschews Hills, has no liking for scrub, and absolutely avoids damp, swampy, low-lying tracts, jungles and forests.

"Bearing this in mind, it may be said that it occurs in all suitable localities throughout the Punjab, Sind, Rajputana, the N. W. Provinces and Oudh, the Western parts of Behar and Chota Nagpore, the Central Provinces and the Central India Agency, including Bundelkhand, Berar, the Nizam's Territory, the whole Bombay Presidency, except the Sub-ghat littoral, Mysore and the Northern and Central portions of the Madras Presidency."

Blanford records that he has seen this Sand-Grouse at Raneegange and I have seen it in the same district of Bhirbhom, Dr. King saw one in the Botanical Gardens, Calcutta (probably an escaped bird), and Blanford again shot some a little to the North of the Cauvery, near Trichinopoly. It does not extend to Ceylon but it is found in Travancore, whence I have received eggs.

Col. Faithful, in epistola, says "about 3 or 4 years ago I came across a flock of about six of the small kind of Sand-Grouse on the Karewa at the back of Ardwin in the Phupiyan direction, these and the one I shot are the only ones I have ever shot in Kashmir. The one I shot was got in the early part of February."

Jerdon gives a most interesting account of this Sand-Grouse and its habits. He remarks "This is the most common and abundant species of Sand-Grouse throughout India, being found in every part of the country, except the more wooded portions, and never occurring in forest districts.

"This Sand-Grouse frequents the bare open plains, whether rocky or otherwise, and is very partial to ploughed lands and bare fallow fields. It feeds chiefly in the morning and between 8 and 9 a. m., goes to drink at some river or tank, at which, in some parts of the country, thousands assemble, and they may be seen winging their way in larger or smaller parties from all quarters, at a great height, uttering their peculiar loud piercing call, which announces their vicinity to the sportsman long before he has seen them. They remain a few minutes at the waters edge, walking about and picking up fragments of sand or gravel, and then fly off as they came. In the hot weather, at all events if not at all seasons, they drink again about 4 p. m. When they are seated on bare sandy or rocky ground, they are most difficult to observe, from the similarity of their colour to the ground; sometimes they can be approached with care near enough to get a good shot, at other times, especially if in large flocks, they are shy and wary. A small flock or single bird can often be approached very close by walking rapidly, not straight, but gradually edging towards them; and, in this way I have often walked up to within two or three yards of them. They feed on various hard seeds, especially on those of various *Abysicarfi*, *Desmodium*, etc., as well as on grass, seeds and grain."

"The bird, if kept long enough, is very excellent eating, though the flesh is somewhat hard and tough, but with a high game flavour; and the young birds when nearly full grown, are excellent."

This species of Sand-Grouse in India is not migratory though it may move about to some slight extent under pressure of climatic conditions and during the height of the extreme dry season may wander into districts it does not visit at other times.

Its drinking hour depends on the season and it often does not drink in the cold weather until nearly 10 o'clock, whereas in May and June it will be found watering as early as 7 a.m. Roughly speaking, it appears to feed for some two hours after the sun is up after which it drinks before settling down for a siesta during the hotter hours of the day. In the evening it often does not drink at all, but during the hot weather thirst generally compels it to drink again before its evening feeding hour and it will then be found at water between 3·30 and 4·30 or a little later. It is not crepuscular in its habits like *Pterocles fasciatus* and *coronatus*.

Its food appears to be entirely vegetarian and even as such confined mainly to hard seeds and grain; in two instances only did Hume find insects in their stomach and I can find no other records referring to this diet. They do sometimes resort to cultivated fields for grain and seed, but for the greater part they keep to the uncultivated plains and it is wonderful the way they manage, not only to obtain enough food to sustain their great vitality but actually to keep them plump and in the highest condition.

They are not as a rule found in enormous flocks such as those of *Pterochurus alchata* and *Pterocles arenarius* and flocks of over 100 are exceptional, though some few of 200 or even more have been seen. Generally the flocks number 20 or 30 to 50 and these come down to water in independent packs, not collecting together for the purpose. Arrived at the water they settle at once, unless alarmed, a short distance from the water and there, like all Sand-Grouse, squat for a few seconds or minutes, before running down to the water edge for their drink. After this they remain a short time and walk about and scatter a good deal, but do not seem to quarrel with one another as so many other Sand-Grouse do, and then all fly off again to their resting place.

Hume says that whereas in the day time when feeding they scatter widely over the ground but that during the night when sleeping they collect in a very compact mass; he also adds "and during the night they must keep better watch than during the day, for often when crossing the huge Oosur plains in Etawah after dark, at times after mid-night, I have heard flocks of them rise at considerable distance from me. Moreover, I have never found any of their feathers about in the morning, as I have of so many ground roosting birds, shewing where a jackal or a fox has made a lucky hit. If one remembers how abundant this species is in many districts and how superabundant in the same places, foxes, jackals and wild cats and also that the Sand-Grouse leaves a strong scent by which a dog will nose out a wounded bird hidden amongst the clods of a ploughed field in a moment, it does speak well for *their* chowkidars that none of these little Sand-Grouse ever seem to fall victims to these midnight marauders.

"Still native fowlers will at times surprise them, and during dark nights, in some fashion, creep up and drop a net over the entire party. The net used is a very light one, a truncated triangle about 8 ft. wide at bottom, 4 ft. at top, and about 4 ft. wide, attached to two light slender bamboos, each about 8 ft. long. The covey is marked as it goes to roost, and then the man about 11 o'clock (the night must be dark, and is all the better for being windy) steals up and drops the net over the whole pack. I went out several nights to try and be present at a capture, but on only one occasion were any caught, and then only two, but a few nights after, the men who were *akerias*, and who were still in my camp, snaring ducks and quails, brought in some forty, that they professed to have caught in this way in one haul, and they were polite enough to hint that it was the bad smell of an European that had foiled their efforts on previous occasions. They were doubtless humbugging in some way but one thing is certain, they do constantly manage to catch whole packs in some way or other during dark nights, and are therefore, though they certainly do not *look* so, considerably sharper than the beasts of the field."

The only way of making a big bag of Sand-grouse is to wait for them at their drinking place, but in this way very big bags indeed can be made, especially when arrangements are made to prevent the birds watering at any other pieces of water within a radius of some miles, as is done sometimes when 'big wigs' have to be provided with sport.

During the non-breeding season shooting over water is legitimate enough for the Common Sand Grouse are strong and good fliers, fly high and take a lot of hitting before they drop. They must, however, be given a rest during the principal breeding season, if this can be defined, and, where it cannot, then the normal season must be allowed them, and the birds forced to adapt themselves to it.

When thirsty they must drink and it takes a lot of shooting to drive them away even temporarily, but Hume mentions a case in the Sirsa district in which the cruel sport was practised by two guns down at the water's edge, and a great number killed and during the next week a large number of eggs were found deserted and destroyed (I suppose by crows and mongooses) in what was known to be a favourite breeding place two or three miles from the tank."

From the above it is plain that these birds can be driven right out of a district by too much prosecution at their drinking places, a fact which should be carefully borne in mind by sportsmen.

Fortunately this Sand-Grouse does not seem to be decreasing in India, bags are made as big now as were made 50 years ago and the flocks seem to be as big and as numerous as ever they were in Hume's time. It is not so long ago that Major Nurse wrote as follows "The Common Sand-Grouse (*Pterocles exustus*) has been unusually abundant at Deesa this year. I feel sure they must have increased in numbers since I first came here, now nearly five years ago. Possibly the last few years, which have been unusually dry, have been especially favourable to their increase. A few weeks ago over 400 were shot over a running stream one morning by a party of 7 or 8 guns, and this at a place where more than 200 birds had been killed on several previous occasions during the course of a few weeks."

Here and there a sportsmen writes to say that he thinks the birds have decreased in numbers, but where this is the case the decrease is generally found to correspond with an increase in cultivation or irrigation and where their haunts have been left untouched there the birds seem to be much as they were in Hume's time.

The Common Sand-Grouse breeds everywhere within its range in India, more freely in some parts than in others according to whether the wide stretches of waste lands it loves and requires are obtainable or not.

The Common Sand-Grouse is an easy bird to domesticate and is often kept by natives and has also been successfully kept by Europeans. Mr. C. Barnby Smith has the following interesting notes on this bird in captivity in the August 1910 number of the Avicultural Magazine "A friend very kindly sent me over three Indian Painted Sand-Grouse (*Pterocles fasciatus*) caught near Bhopal in Central India. The birds (a cock and two hens) arrived in good health in the early part of last February. At the same time a consignment of the Common Pintail Sand-Grouse (*P. exustus*) arrived. These birds seem to travel well, as out of eighteen birds that left Calcutta sixteen arrived alive.

"Such of the Pin-tailed Sand-Grouse as I retained for myself I put at first with the Painted Sand-Grouse in the conventional sort of place—a large wooden shed (with sand floor) open on the South, on which side it has a sort of glass verandah with grass on the ground underneath.

"The birds were, and are, fed on millet, canary, maw, rape and hemp seeds, but seem to like millet best of all. They are also supplied with lime, small flint, grit and rock salt.

"The Pin-tailed Sand-Grouse do not seem to care for grass at all but love to squat in the sand, basking in the sun whenever possible. The greatest danger with these birds seems to be their sudden panics, which makes them dash violently against the sides of the enclosures unless the feathers of one wing are heavily cut. My birds arrived late at night (as birds always seem to do) and when I went to look at them the following morning the whole lot were dashing with wild flights and shrieks of terror in all directions. It was only prompt and resolute action with a landing net and subsequently with a pair of scissors that put a stop to their apparently determined efforts at suicide.

"The Pin-tailed Sand-Grouse soon become comparatively tame and run about on the sand with contented little "crooning" cries. I have noticed they are much steadier when divided as, when a lot are together, the alarm note of one at once sets off the others attempting to fly. So far I have seen no signs of nesting, though I have divided them into several different enclosures in hopes they will do so."

What constitutes the breeding season of the Common Sand-Grouse is, it must be admitted, practically impossible to determine and the utmost one can say is that more breed in some months than in others and even thus we must hedge and allow that what are the favourite months in one place need not be so in another place no great distance away. For instance, if we take the three places Sirsa, Hissar, and Hansi, all close together in the South of the Punjab, we find that the British Museum has a series of no less than 75 eggs from round about these towns which were taken in the following months:—

| | | | |
|---|---|---|---|
| March | ... | ... | 9 |
| April | ... | ... | 23 |
| May | .. | ... | 6 |
| June | ... | ... | 5 |
| July | ... | ... | 9 |
| August | ... | ... | 0 |
| September | ... | ... | 8 |

and 35 are not dated. This does not help us much but would seem to infer that they do not lay in the cold weather. If we then turn to Hume's "Nests and Eggs" we find Khan Nizam-oo-deen, Khan Bahadur, took eggs at or near Sirsa on the following dates:—

| 1869 | 1870 |
|---|---|
| January | ...... |
| February | 3rd, 24th. |
| March | 1st, 4th, 12th, 21st. |
| April | 21st, 22nd, 27th, 28th. |
| May 8th & 25th. | 1st, 3rd, 5th, 7th, 15th, 28th, |
| June 16th, 17th, 30th. | 11th, 15th, 21st, 30th. |
| July 1st, 2nd, 5th, 10th, 11th, 12th. | 23rd. |
| August | ...... |
| September 1st, 2nd, 3rd, 7th, 10th | ...... |
| October | 3rd, 22nd. |
| November | 24th. |
| December | 7th, 20th. |

Here we have eggs in every month but January and August, but the favourite months may be said to be March to July. In confirmation of this, Mr. R. M. Adam says that about the Sambhar Lake they breed in great numbers in April and May. Mr. J. Davidson took these eggs from January to June in the Deccan and Major Cock found them breeding at Nowshera in May and June, whilst Mr. A. Anderson says that in the Doab they breed in March, April and May and finally Col. Butler found their eggs at Dungarwar (55 miles South of Deesa ) in March and May. On the other hand Davidson found them breeding in Western Khandesh in February, in the same month Col. Butler found their eggs in Belgaum and Mr. Hastings took their eggs in October in Etawah, S. W. United Provinces.

Col. Bingham wrote to me that he took their eggs near Mhow in January and Mr. E. G. Phythean Adams also wrote to me to the effect that he found them laying round about Poona in December, January and February.

The only conclusion one can draw is that these birds breed more or less throughout the year but that in North and Central India more breed from March to July than in other months, whilst further South they breed earlier, the majority in February and March. It is probable also that most birds lay twice in the year at least.

The eggs are laid in a depression in the soil, either natural or scratched out by the birds themselves. In the very great majority of cases there is no lining of any sort whatsoever, but Adams, Anderson and one or two other observers have found a certain amount of grass placed in the hollow as a sort of rough lining. How rare, however, it is to find such, is shown by the fact that in the enormous number of nesting places found by Hume, Davidson and the Khan Bahadur, never once did any of them ever find any lining placed in the depression below the eggs.

Three is the number of eggs almost invariably laid, but occasionally two only are incubated. The stories, however, of five and four eggs being laid by the same bird are almost certainly the result of two birds laying in the same nest-hole or of some mistake on the part of the collector. Both birds take part in incubation, and as the eggs are laid in great open plains, generally with no scrub, grass or stone to shield them from the sun, the birds have to cover the eggs in the heat of the day to prevent them being killed, if not cooked by the sun. Now and then the birds may take advantage of the cover afforded by a tuft of grass or small bush, or she may lay her eggs in amongst stones which partially shield them from the sun, but she never makes her nest-hole in among bushes and jungle as does *Pterocles fasciatus*. Hume says the haunts it loves best as breeding sites are scattered stubble or fallow, or newly ploughed fields rather than the large semi-desert plains surrounding them.

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Mr. A. Anderson found them breeding in a curious place "a plain covered from miles with *reh* (a saline effervescence) which gave the ground the appearance of being carpeted with thick snow" on this ground he flushed a Sand-Grouse from a pair of eggs and he goes on to note "my camp being close to this place, I amused myself in watching the birds incubating, feeding, round about their nest and dusting themselves after the fashion of fowls. On the 4th as I approached the nest, the bird glided off, and skulked away in a crouching position, so as to avoid detection and then squatted."

Incubation appears in India to extend over 16 or 17 days but may vary more than this according to the time of year in which they are laid. Mr. Meade Waldo who has been successful in rearing these birds in captivity reports (Avicultural Magazine, March 1913), that eggs layed in April were not hatched until the 23rd day, whereas others laid in July were hatched in 18-19 days.

In this article Mr. Meade Waldo writes "The procedure of these birds is precisely the same as the Greater Pintailed Sand-Grouse (*Pterocles alchata*), *viz.*, the female incubates by day, the male by night, and the male soaks his breast with water for the young to drink or rather suck."

As regards their eggs I have but a poor series and can add nothing to what Hume has recorded in "Game Birds." Here he describes them as follows:

"The eggs, like those of all other Sand-Grouse, are long and cylindrical, like those of a Night Jar. The texture is fine and smooth and they have generally a fine gloss. Not only in shape, but in marking also, do many of them strongly resemble those of some species of Night Jar. The ground colour varies much; in some it is a pale, somewhat pinkish stone colour, in others greyish or dingy or greenish white; in some pale *cafe-au-lait*, in others a somewhat light olive brown. Typically they are thickly spotted, streaked or irregularly blotched, pretty uniformly over the whole surface with two sets of markings, the one of darker or lighter shades of olive brown, the other a sort of pale inky purple, and these latter, which are most commonly streaks and clouds, seem to underline the others. Different eggs vary much in the distribution, size and intensity of these markings, as also in the relative proportion of the extent of surface covered respectively with what I may call the primary and secondary markings; in some almost the whole ground colour not occupied by the primary markings is clouded with the pale inky purple, in others only here and there a few spots of this colour are traceable; in some all the markings are small, very thickly set and freckled, in others they are bold, large, eccentrically shaped blotches, comparatively thinly distributed over the surface. Some of the eggs are, as a whole, very much darker coloured than others, and in some the ground colour might perhaps be best

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described as a faintly greenish-grey. As a rule the paler the ground, the paler the markings, and *vice versa.* Exceptionally beautiful marbled eggs are met with, as also unmottled pale creamy varieties. I have never, however, seen one that could be taken for an egg of *fasciatus.*"

"The eggs vary in length from 1·32″ to 1·6″ and in breadth from 0·93″ to 1·11″; but the average of 70 eggs is 1·45″ by 1·03″."

Reducing Hume's figures to millimetres we get respectively 33·6 to 40·5, 23·2 to 28·2 and 36·8 × 26·2 mm.

Oates gave the measurements of the eggs in the British Museum as running up to 1·15″ (29·2 mm) in breadth and the average of 129 eggs in that Museum added to 102 other eggs of which I have obtained the measurements, is exactly the same as that given by Hume.

It is not possible ever to confound these eggs with those of the Painted Sand-Grouse (*Pterocles fasciatus*) for these latter are always salmon, bright buff or pink in general tone, whereas those of the Common Pintail Sand-Grouse (*Pteroclurus exustus*) are always greyish, or olive grey in tint when looked at as a whole.

(*To be continued.*)

# SCIENTIFIC RESULTS OF THE MAMMAL SURVEY.

BY OLDFIELD THOMAS, F. R. S.

## No. VII.

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Mr. Shortridge's magnificent collection from Mount Popa and other parts of Central Burma has now been received at the National Museum, and pending the return to London of Mr. Wroughton, who will, I hope, give a detailed report on it, I propose to give notes and descriptions of such things in it as appear to need special attention.

### MENETES BERDMOREI AND ITS SUBSPECIES.

The Popa collection contains a series of specimens of a particularly beautiful Menetes, and on laying out the whole available material of the group, I find that there appear to be five recognizable forms, which may provisionally be considered as subspecies of *M. berdmorei*.

It should be premised that the presence or absence of the main lateral black stripes does not appear to be a racial, but, as in many forms of *Tamiops*, a seasonal character, for January and early February specimens, at least of subsp. *consularis*, are quite without them, while they become developed in specimens taken at other times of the year. Whether this is equally the case in the other subspecies our material does not enable me to state. It is however possible that since, even in the fully striped phase, *consularis*, has the least amount of striping, so it has also alone developed (or retained) a seasonal suppression of the stripes, and that other forms have them all the year round. January specimens of the Mt. Popa and other forms would therefore be particularly interesting.

The five subspecies may be diagnosed as follows :—

1. Median dorsal black line and upper lateral ones present, though not very conspicuous. Undersurface strongly washed with buffy. *M. berdmorei berdmorei.*

Rangoon, Martaban and neighbouring parts of Tenasserim.

2. Like *berdmorei* in having inconspicuous median dorsal, and upper lateral blackish lines, but the undersurface white or whitish. *M. b. mouhoti*, Gray. (Syn. *Sciurus pyrrocephalus*, M. Edw.) Siam south of Bangkok, Camboja, Cochin-China.

3. Median dorsal and upper lateral dark streaks prominent, all the markings very strongly defined, the main dark lateral band broad and glossy black ; an additional blackish streak edging the belly ; general body colour clear grizzled olive, undersurface and tips of tail hairs pure white. *M. b. decoratus*, subsp. n.

Mount Popa, dry zone of Burma.

4. Markings about as in *decoratus*, but less conspicuously contrasted, owing to the general body colour being darker and duller, more olive brown, undersurface and tips of tail hairs yellowish. Size rather larger than in other forms. Muzzle of skull unusually slender. *M. b. moerescens*, subsp. n.

Annam.—Type from Bali near Nha-trang.

5. No median dorsal stripes or upper dark lateral ones, the only dark streak being that between the light lateral streaks and even this is absent in January and February. Undersurface yellowish white. *M. b. consularis*, subsp. n.

Siam north of Bangkok. Type from Nan. 200 m.

Three specimens from Myawadi and Kaukaryit, E. of Moulmein, seem also to belong here, but as they were killed in January and February, and might possibly represent an "eclipse pelage" of *M. b. berdmorei*, their determination must still remain a little doubtful.

These are the specimens referred to by Blanford (J. A. S. B., XLVII, p. 162, 1878) who recorded their differences from *berdmorei*, but assigned them to *mouhoti*, to which they do not seem to have any greater resemblance.

Measurements and other details of types of new subspecies:—

*Menetes berdmorei decoratus.*

Head and body, 188 mm; tail 175; hindfoot 43·5; ear 21.

*Skull.*—Greatest length 49; zygomatic breadth 26·3; palatilar length 23; front of $p^4$ to back of $m^3$ 9.

*Hab.*—Mt. Popa, up to about 4,000′.

*Type.*—Adult female. B. M. No. 14.4.3.4. Original number 3844. Collected, 20th September 1913, by G. C. Shortridge. Presented by the Bombay Natural History Society. Thirty specimens obtained.

*M. b. consularis.*

Head and body 179 mm; tail 151; hindfoot 40; ear 21. Skull, greatest length (*c*) 49; zygomatic breadth 25·5; palatilar length 23; $mp^4$ and three molars 8·4.

*Type.*—Immature female, B.M. No. 2.6.6.6. Original number 159. Collected, 6th October 1901, and presented by Th. H. Lyle, Esq. About a dozen specimens examined, mostly presented by Mr. Lyle.

*M. b. moerescens.*

Hindfoot 41 mm.

*Skull.*—(Immature) greatest length 51; zygomatic breadth 28, palatilar length 22·2; $mp^4$ and three molars 9·6.

*Type.*—Immature female. B. M. No. 6.11.6.32. Original number 38. Collected at Bali near Nha-trang, Annam, by Dr. J. Vassal.

This animal may hereafter prove to be specifically distinct from the other forms by its large skull and long narrow muzzle, but without fully adult specimens this point cannot be finally settled.

## DREMOMYS RUFIGENIS.

### *The red-cheeked Squirrel.*

This species was originally described from Mount Mooleyit, Tenasserim, and other specimens have since been referred to it from Siam and Yunnan. In addition, two subspecies have been described by Bonhote, *D. r. belfieldi*, from the Malay Peninsula, and *D. r. fuscus* from Annam.

In the Burma collection there are four specimens of it from the Mandalay region, representing a new subspecies, while I also find it necessary to distinguish the Yunnan race as a fifth local race.

It is however to be noted that these animals show a remarkable variation in the shape and size of the skull, some having comparatively small skulls, with conical muzzle, while others have a larger skull with larger brain case and a longer muzzle which is more pinched in laterally. Possibly there may prove to be more than one species among them, but for the moment I leave them provisionally all under the specific name of *rufigenis*. Further series, showing change of skull with age, and exact geographical distribution and intergradation (or otherwise) of the different forms will be needed before any final conclusion can be arrived at.

## DREMOMYS R. ADAMSONI, subsp. n.

### *Adamson's red-cheeked Squirrel.*

General characters as in true *rufigenis*. Body with the same drabby or muddy suffusion in the olive of the upper surface, the rump and hips similarly more brown. Top of muzzle less rufous, with hardly a trace of ferruginous in its grizzling. Patch behind ear small, dull buffy. Rufous of cheeks less extended, almost replaced by brown between eye and ear. Under surface conspicuously whiter; the interramia and throat almost pure white, the belly hairs with their white tips almost hiding their slaty basis, and the hairs in the inguinal region and on the inner side of the thighs prominently white. In *rufigenis* the hairs of the throat and inguinal regions are more or less washed into ochraceous.

Skull of the size and shape of that of *rufigenis*. Posterior edge of nasals V-shaped, the angle forwards.

*Dimensions of the type.*—Head and body 200 mm; tail 125; hind-foot 43; ear 21.

*Skull.*—Greatest length 52; zygomatic breadth 27·5; nasals 16 × 6·5; interorbital breadth 14·4; breadth of brain case 22·2; palatilar length 22; $p^4$ and three molars 8·8.

*Hab.*—Upper Burma. Type from Maymyo, alt. 2,800′. Other specimens from Kalaw, S. Shan States, 4,800′.

*Type.*—Adult male, B. M. No. 14.4.3.3. Original number 3433. Given to Mr. Shortridge by its collector Mr. J. P. Cook. Presented to the National Museum by the Bombay Natural History Society.

This squirrel is primarily distinguished from true *rufigenis* by its much whiter undersurface, and especially its white throat and inner side of thighs.

Named in honour of Sir Harvey Adamson, K.C.S.I., Lieut.-Governor of Burma, to whom Mr. Shortridge and the Mammal Survey in Burma have both been much indebted for assistance of various kinds.

### DREMOMYS R. ORNATUS, subsp. n.

*The Yunnan red-cheeked Squirrel.*

General appearance of *rufigenis*, but skull characters as in *belfieldi*.

Coloration almost as in true *rufigenis*, but the back a clearer olive without any muddy or drabby tinge, and the rump with scarcely any suffusion of brown. Undersurface as *rufigenis*. Sides of face brighter ferruginous, the rusty extending further back on the upper surface of the muzzle, nearly to the level of the ears. Patches behind ears buffy.

Skull very different from that of *rufigenis*, but indistinguishable from that of *belfieldi*. Larger than in *rufigenis*, the muzzle very long, pinched in at sides; the nasals long, their hinder end directed transverse. Forehead broad, flat, with more transversely directly postorbital processes. Brain case large. Zygomatia widely expanded.

*Dimensions of the type.*—Hindfoot, 44.

*Skull.*—Greatest length 58·2; condylo-incisive length 50·3; zygomatic breadth 31·6; nasals 21 × 7; interorbital breadth 16·7; breadth of brain case 25; palatilar length 24·2; $p^4$ and three molars 9·7.

*Habitat.*—Yunnan (Probably from near Mong-tze).

*Type.*—Old female. B. M. No. 12.7.25.20. Original number 11. Collected 4th February 1910 by Mr. Alan Owston's collector H. Orii. One specimen.

Distinguished from *rufigenis* by its large skull and long muzzle, and from *belfieldi* by its brighter coloration.

### *Flying Squirrels.*

No Petaurista is contained in the Popa collection, but one was obtained in the Shan States by Capt. Venning, who has presented it to the survey. It proves to be a new subspecies and may be called—

### PETAURISTA LYLEI VENNINGI, subsp. n.

*Venning's Flying Squirrel.*

Similar in general characters to true Siamese *lylei*, but with the undersurface browner, less ferruginous.

Size as in *lylei*. General colour above on superficial view very much as in that animal, the fur with a similar prominent ticking of white, but the underfur is wholly dark blackish slate, without the concealed suffusion of ferruginous found in the Siamese form. Ears similarly long, with the proectote tending to rufous, and the metectote black, but the former is of a duller tone, approaching fawn. Eyes with black upper and lower rims, without the small rufous spots found in *lylei* both above and below the eye. Undersurface much more brownish than in *lylei*, nearly matching Ridgway's "fawn colour", therefore very different from the brilliant rufous or ferruginous of *lylei*.

Parachute darker throughout than in *lylei*, its upper side dark chestnut brown, its lower vinaceous brown. Hands, feet and tail black.

Skull as in *lylei*, but the bullæ in the single specimen larger than in the available skulls of *lylei*.

*Dimensions of the type* (measured in the flesh by Capt. Venning).—Head and body 455, tail 635, hindfoot 83, ear 51.

*Skull.*—Greatest length 82; condylo-incisive length 74; zygomatic breadth 52; nasals 25 × 16·5; interorbital breadth 18·5; palatilar length 37·2; $p^4$ and three molars 17·5.

*Habitat.*—Southern Shan States. Type from Kalaw, west of Taunggyi, alt. 4,700′.

*Type.*—Adult male, B. M. No. 14.4.3.1. Original number 3374. Collected 15th May 1913, and presented to the Survey by Capt. F. E. W. Venning.

This fine animal is a Burmese representative of the Siamese *P. lylei*, from which it differs by its browner undersurface.

### *The smaller Flying Squirrels.*

Of the smaller Flying Squirrels, the Burmese collection contains three species, one of them belonging to the genus Belomys, and the other two to Sciuropterus, subgenus Hylopetes.

The *Belomys* unfortunately is only represented by a young example from Mt. Popa, and an imperfect skin without skull from Yin Village, Lower Chindwin. Neither is determinable with certainty, but the relationship to *B. trichotis* of Manipur will no doubt prove to be close.

The larger Sciuropterus seemed to be fairly numerous, and Mr. Shortridge succeeded in getting 35 specimens of it. An examination of these shows that it is a local form of *S. phayrei* of Pegu and Tenasserim. It may be called—

### SCIUROPTERUS PHAYREI PROBUS, subsp. n.

Like true *phayrei* but tending to be lighter coloured throughout, not so much in the general colour as in the greater extent of whitish on the undersurface of neck, limbs and tail. General colour above light wood-brown, a prominent patch on sides of cheek and neck greyish white. Muzzle more greyish white than brown. Undersurface nearly wholly pure white, a few hairs only on the sides of the belly with slaty bases.

Hands and feet only brown at the base, and on the middle line, the sides and the whole of the digits whiter—in true *phayrei* the feet are wholly brown with the exception of a few hairs at the root of the claws. Tail drabby basally, darkening to blackish brown at the tip, the darkening less rapid and less intense than in *phayrei*.

*Dimensions of the type* (measured in the flesh).—Head and body 148; tail 128; hindfoot 30·5; ear 23. Skull, greatest length 39·3; condylo-incisive length 35; zygomatic breadth 24·2; nasals 10·2; palatilar length 17·2; $p^4$ and three molars 7·8.

*Type.*—Adult male. B.M. No. 14.4.3.2. Original number 3601. Collected on Mt. Popa at about 3,000′, 7th September 1913, by G. C. Shortridge, and presented by the Bombay Natural History Society.

This form, distinguished by its nearly wholly white feet, is of about the same size as true *phayrei*. On the other hand the Siamese representative of *phayrei* is larger, though on account of its general identity in colour and other characters I should still call it the same species.

### SCIUROPTERUS PHAYREI LAOTUM, subsp. n.

Larger than *phayrei* and *probus*.

Coloration about as in *probus*, though the undersurface tends to be more largely mixed with slaty, and the white itself is less pure. Hands and feet brown with white digits.

*Dimensions of the type* (measured on the skin).—Hindfoot, 34 mm.

Skull, greatest length 42; condylo-incisive length 38·3; zygomatic breadth 16·2; nasals 10·5 × 6·6; palatilar length 19; $p^4$ and three molars 7·3 (worn and crushed together, 8·9 in one of Mr. Lyle's specimens.)

*Habitat.*—Laos Mts. and Siam.

*Type.*—Adult female. B. M. No. 62.8.16.3. Collected by Mouhot.

Mr. Lyle obtained four examples of this flying squirrel in Northern Siam, but unfortunately two of their skulls are lost, one is broken, and the fourth shows signs of having been in captivity. I have therefore had to select Mr. Mouhot's specimen as the type.

All the specimens agree in the greater length of the hindfoot as compared with *phayrei* and *probus*.

The third small Flying Squirrel in the collection is *Sciuropterus spadiceus*, Blyth, represented by a single specimen from Maymyo near Mandalay, presented by Mr. G. B. H. Fell.

### MILLARDIA KATHLEENÆ, sp. n.

*Ryley's Soft-furred Rat.*

A light coloured *Millardia*, with white tail tip and only 0—2=4 mammæ. Size about equal to that of the largest of the known species.

General colour above, pale sandy fawn, not unlike that of *M. meltada pallidior*, Ryley. Flanks and regions round eyes brighter fawn. Undersurface pale greyish white, the bases of the hairs generally pale slaty, but those on chin and in the inguinal region white to their bases. Ears fairly large, greyish, differing little in colour from the general tone. Hands and feet white; soles with only four pads, the normal murine fifth and sixth completely absent. Tail varying from rather shorter to rather longer than the head and body, thinly haired, not pencilled, greyish brown for the greater part, sometimes the whole of its length, white below and terminally; about 12 rings to the centimeter. Mammæ 0-2=4.

Skull on the whole very similar to that of *M. meltada*. Nasals narrow. Superorbital ridges well marked. Interparietal more triangular, with a greater antero-posterior diameter. Anterior palatine foramina not elongated. Bullæ very large, larger than in any of the known species either of *Millardia* or the other allied genera.

*Dimensions of the type* (measured in the flesh).—Head and body 145 (range 131-166); tail 148 (130-159); hindfoot 27 (26-30); ear 21 (20-23).

*Skull.*—Greatest length 35·4; condylo-incisive length 33·2; zygomatic breadth 17·7; nasals 14·5; interorbital breadth 5; interparietal 5·3 × 9·5; palatilar length 16·5; palatal foramine 8·6; upper molar series 5·7.

*Hab.*—Dry zone of Burma. Most of the specimens, including type, from Pagan: a few from Mt. Popa.

*Type.*—Adult female. B. M. No. 14.4.3.5. Original number 4095. Collected at Pagan, 16th October 1913.

This Burmese rat forms a very distinct new species, as all the previously known members of *Millardia* have 2-2=8 mammæ, normal sized bullæ, and generally some trace of a fifth hindfoot pad. They are also all inhabitants of the Peninsula of India, not extending east of the Bay of Bengal.

I have named the species in honour of Miss Kathleen Ryley, to whom the Survey is much indebted for the work she has done on its collections during the temporary absence of Mr. Wroughton. I venture to hope that on her return to England she will again take up the subject of Indian mammalogy, with the help of the increased material which the Bombay Society's Survey is bringing together.

## MUS NITIDULUS, Blyth.

### *Berdmore's Mouse.*

This species has always been a puzzle, and owing to the loss of the type from the Calcutta Museum, its proper identification continues to be a difficulty. The two mice from Sikhim that I assigned to it in 1881 are certainly something different, but owing to the bad condition of one and the immaturity of the other I cannot at present make any satisfactory determination of them.

In the Burmese collection Mr. Shortridge obtained two species of *nitidulus* like mice, a larger and a smaller, and on comparing Blyth's description[1] with these two species, I have come to the conclusion that it is the smaller one, the *Mus*, which, pending the arrival of topotypes, should be provisionally assigned to *M. nitidulus*, and that the Leggadilla is new. Beyond saying that it has 12 mammæ or more, I will not now describe the form I assign to *nitidulus*, as this naming may hereafter be again upset, but it certainly agrees very closely with Blyth's description, such as that is.

The larger species I propose to term—

## LEGGADILLA SHORTRIDGEI, sp. n.

### *Shortridge's Leggada.*

Size comparatively large, larger than in any of the species mentioned by Wroughton and Ryley. Fur thickly mixed with spines, the spines on the back about 8-9 mm. in length. General colour drab-grey, the bases of the fur pale grey or whitish grey, the ends of the hairs pale drab, of the spines black.

Undersurface drabby whitish, the hairs slaty at base; line of demarcation on sides not very sharply defined. Ears scarcely darker than the general colour. Hands and feet white. Tail shorter than head and body; brown above, whitish below, not sharply defined; caudal rings about 16 to the centimeter. Mammæ 3-2=10.

Skull long and slender, with long, narrow muzzle. The raised superorbital bead characteristic of *Leggadilla* as opposed to *Mus* well defined, starting close behind the back of the nasals, and continued backwards across the parietals. Palatal foramina to the level of the front of the inner root of $m^1$.

Teeth those of a typical *Leggadilla*, conspicuously larger than in the species I refer to *Mus nitidulus*.

*Dimensions of the type* (measured in flesh) :—Head and body 122mm. (range 110-125); tail 101 (85-103); hindfoot 21·5 (20-22); ear 17·5 (17-19).

*Skull.*—Greatest length 30; condylo-incisive length 29·2; zygomatic breadth 15; nasals 13; interorbital breadth 4·3; interparietal 3·8 × 10; palatilar length 14·3; palatal foramina 7·2; upper molar series 4·6.

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[1] J. A. S. B. XVIII, p. 294, 1859.

*Hab.*—Mt. Popa, Upper Burma.

*Type.*—Adult male. B. M. No. 14.4.3.6. Original number 3936. Collected 30th September 1913. 36 specimens.

Like *Millardia kathleenæ* this *Leggadilla* represents a considerable extension of the range of the genus to which it belongs. For any small mice previously assigned to *Leggada* and coming from east of the Bay of Bengal are really members of *Mus*, as recently restricted by Wroughton and Ryley, and do not belong to the *platythrix* group, to which alone the name of *Leggadilla* is applicable. All the known forms are from the Peninsula of India.

I have named this well marked species in honour of Mr. Guy C. Shortridge, its discoverer, to whose wonderful energy and collecting talents so much of the success of the Bombay Society's Survey is due.

# DESCRIPTION OF A NEW SPECIES OF GORAL (*NEMORHÆDUS*) SHOT BY CAPTAIN F. M. BAILEY.

BY

R. I. Pocock, F.R.S.

Capt. F. M. Bailey recently sent to Messrs. Rowland Ward the skin and skull of an adult specimen of a Goral shot in Po Me in Tibet and, suspecting it might prove of interest from the locality standpoint, if from no other, asked me to examine it. His suspicions proved well founded, for the specimen turns out to be an undescribed form related to the two Himalayan species of Goral (*Nemorhædus goral*, and *N. hodgsoni*) recently described in this Journal (J. Bombay Nat. His. Soc. XXII, pp. 313-314, 1913). Its relationship with these species and not with the Chinese types of goral is shown by the shortness of the tail and by the extension of the black patch over the knees of the front legs.

## *NEMORHÆDUS BAILEYI*, sp. n.

General colour a uniform dark-brown on the body, rather paler on the sides and belly than on the back, but with no distinct black speckling on the hairs. A black spinal stripe extending from the crown of the head to the tail, deeper in tint upon the head and neck than on the back and gradually fading posteriorly upon the croup. Tail short and mostly black, but with some brown hairs on its upper side. A distinct dark patch above the rhinarium on the muzzle. Upper and lower lips with a narrow white rim, but the rest of the lips darkish. At the upper end of the throat a narrow elongated area of white hairs and the hair-whorls on the inner side at the base of the forelegs forming two large white patches. Forelegs dark yellowish brown, brighter on the feet and on the inner side; a short black patch extending over the middle of the knee but not above or below it to any appreciable extent. Hind legs the same colour on the front, without any definite dark strike extending up their posterior surface towards the root of the tail; inside of thighs at base dirty white.

Measurements.—Length of head and body 42¾ in.; height at shoulder 25¼ in.; length of tail 3¼ in.; of ear 4¼ in.; of horns 5 in.

Loc. Dre on bank of Yigrong Tso (Lake) in Po Me. 9,000 ft. July 3rd, 1913. An adult male, example (*Type*).

The dark coloration and the presence of the black spinal stripe rugged. Hindrip between this species and *N. hodgsoni* rather thin with the grey goral *N. goral*. The three may be distinguished and contrasted as follows:—

*a*. A very small white patch at the upper end of the throat; a large conspicuous white patch on each side of the chest in front close to the base of the legs … … … *baileyi*.

*b*. A large white or dirty white patch at upper end of throat; patches on the chest near forelegs not white and not sharply differentiated from the adjacent area.

- *a*¹. Dark brown speckled with black, a dark spinal line, etc. … … … … *hodgsoni*.
- *b*¹. Grey, speckled with black, no conspicuous dark spinal stripe … … … *goral*.

From the brief diagnosis contained in the table, I have omitted the general coloration of *N. baileyi* which differs from that of *N. hodgsoni* and of *N. goral* in being without the black speckling on the hairs, the colour being remarkably uniformly brown. This may prove to be a distinctive character but the coat is not in sufficiently good condition to justify confidence on that point.

# A POPULAR TREATISE ON THE COMMON INDIAN SNAKES.

ILLUSTRATED BY COLOURED PLATES AND DIAGRAMS.

BY

MAJOR F. WALL, I.M.S., C.M.Z.S.

*Part XXII (with Plate XXII, Diagrams and Maps.)*

*(Continued from page 760 of Volume XXII.)*

The next three species dealt with in this series of papers belong to the genus *Zamenis*, and are *Z. fasciolatus*, *Z. ventrimaculatus*, and *Z. diadema*. *Z. mucosus*, the commonest, and most widely distributed has been already discussed in a former paper (Vol. XVII, p. 259). When Mr. Boulenger's catalogue appeared in 1896, the genus included 34 species chiefly Asian and American. Of this total 10 occur within Indian limits.

## *ZAMENIS FASCIOLATUS.*

### THE FASCIOLATED RAT-SNAKE.

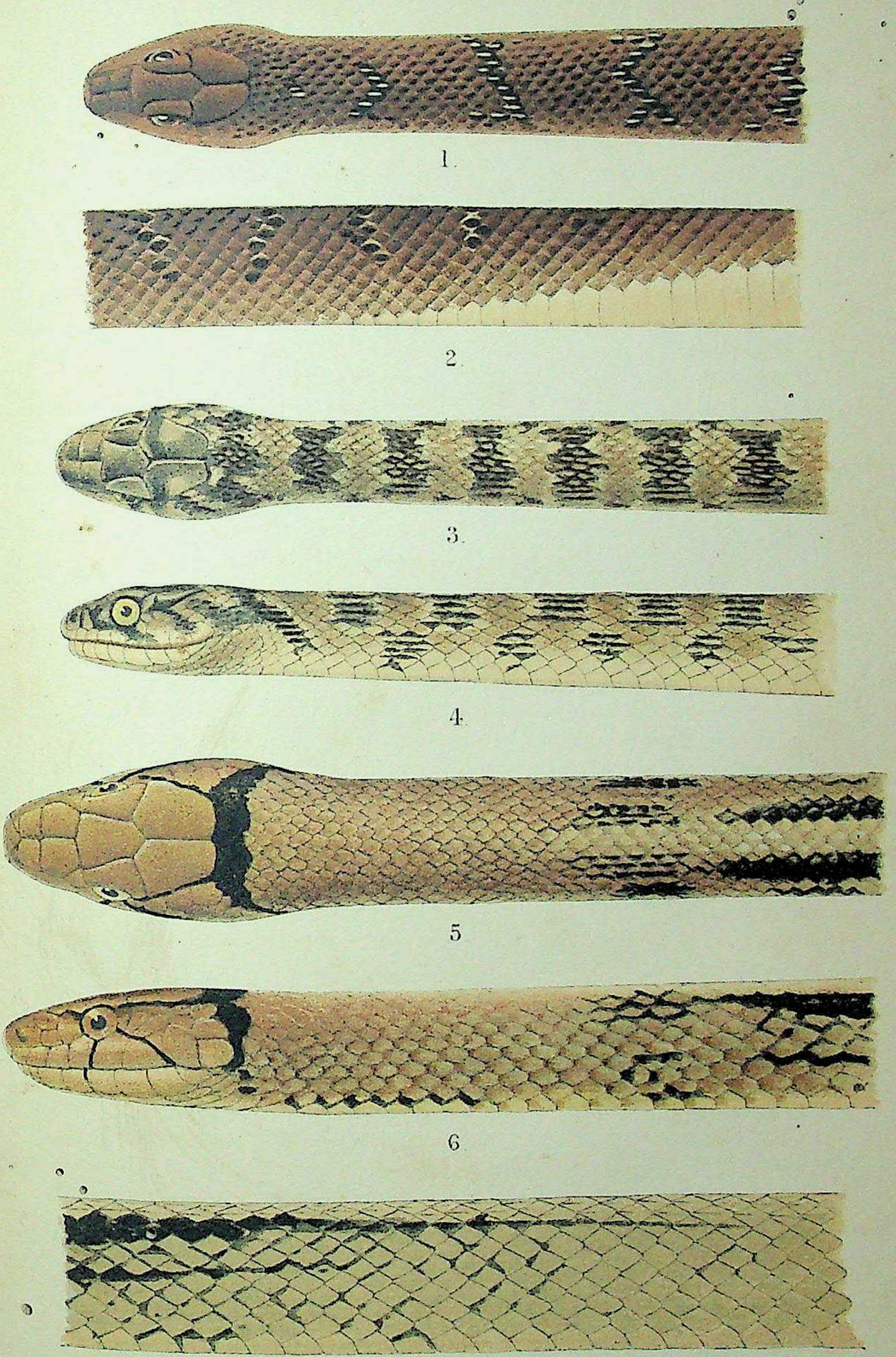
*History.*—Russell in his great work on the Indian snakes, published in 1796, was the first to mention this snake, and this Volume contains an excellent coloured plate (No. XXI) of a handsomely marked juvenile specimen. Shaw in 1802, and Daudin in 1803, next referred to it, and then Cantor in 1839. Since then many writers have contributed scraps of information concerning it.

*Nomenclature.*—(*a*) *Scientific.*—It received its specific baptism in 1802. Shaw's name (a diminutive form of the Latin *fasciatus* "banded") having reference to the narrow crossbars usually so distinct in early life. It was assigned to its present place among the *Zamenis* by Günther in 1864. The generic name is from the Greek "Zamenes" meaning "very strong."

(*b*) *English.*—I can suggest no better name than the fasciolated rat-snake which is the equivalent of its scientific designation.

(*c*) *Vernacular.*—"Nooni paragoodoo" is the name Russell gives on the authority probably of natives in Vizagapatam, since "gedi paragoodoo" or "grass runner" is the name given to the Krait in the Vizagapatam District, according to the same author. I am told that "nooni" is Telugu for oil, and "paragudu" means "runner." The former word which I believe is also used for glistening is probably suggested by the smooth and polished character of the scales.

*Colour.*—The prevailing hue dorsally is some shade of brown, or olive-brown, some specimens being very light and almost yellowish, others very dark. Young specimens are beautifully ornamented



P. Gerhardt del.

J. Green, Chromo.

THE COMMON INDIAN SNAKES. (Wall.)

1-2. *Zamenis fasciolatus*, *harmless*. 3-4. *Zamenis ventrimaculatus*, *harmless*.
5-7. *Coluber radiatus*, *harmless*.

with crossbars, spotted or variegated with black and brown on a whitish ground. These bars are most conspicuous anteriorly and gradually disappear before, at, or at some distance behind the middle of the body. They become increasingly obscure as age advances, and some old specimens are nearly uniform in colour. The head is usually uniform olivaceous, and without any markings, but a young specimen of mine in Fyzabad was marbled with lighter hues. The belly is uniformly whitish, or yellowish. In my young specimen it was greenish-yellow.

*General characters.*—The head is of moderate length and width. The upper jaw projects rather prominently, and is sometimes rather parrot-like. A "canthus rostralis" is moderately evident. The nostril is of fair size, and occupies the upper two-thirds of the suture between the nasal shields. The eye is about half the length of the snout, and its round pupil easily discerned in life. A neck is fairly evident. The body is round, moderately long and smooth, and the tail is slender in form, and accounts for one-fourth to one-fifth the length of the snake.

*Identification.*—In many respects it is very like Hodgson's rat-snake (*Coluber hodgsoni*), a Himalayan species. It bears a superficial resemblance to Cantor's rat-snake (*Coluber cantoris*), another Himalayan form, and some other species of *Zamenis* and *Coluber* as well as the cobra. It is best recognised by attention to its scale rows first. These are usually 21 at a point two headslengths behind the head, 23 in midbody, and 17 two headslengths before the vent. Added to this the anal shield is divided; the supralabials are 8, the divided 3rd with the 4th and 5th, or the divided 4th with the 5th and 6th touching the eye; and the præocular touches the frontal shield.

*Length.*—It grows to upwards of three feet. The largest I have examined measured 4 feet 2½ inches.

*Disposition.*—It appears to be a plucky and vicious snake when molested. The few comments in this direction to be found in the literature on the species are in agreement. Stoliczka says it is rather a fierce snake when molested, and Blanford speaking of a specimen he encountered says, though young, it was one of the fiercest snakes he ever captured. The only specimen I have ever seen alive, probably a hatchling, was remarkably active and plucky. I understand from Mr. Millard, who is very familiar with it, that it is on account of its habit of flattening its body and a general resemblance in colour and appearance to a small cobra when moving that the Konkani natives so frequently declare it is a female cobra. My yonng specimen gave me a lively exhibition of its cobra-like behaviour. It erected itself probably as high relatively as a cobra would do, and flattened itself very remarkably.

*Habits.*—I believe it frequents jungly tracts chiefly, but will stray into populated areas, and according to Stoliczka has been known to enter houses in Calcutta.

*Food.*—A specimen sent me from Patna had swallowed a rat. Stoliczka, however, remarks that it feeds on frogs and worms.

*Breeding.*—Very little is known in this connection. A specimen which I took to be a hatchling, measuring 11¼ inches, was captured by me in Fyzabad in the month of July. Mr. D'Abreu told me of a hatchling he obtained in Patna in May.

*Distribution.*—Though Jerdon remarks that it is not uncommon in the Carnatic, this has not been my experience. I never obtained one when in residence in Southern India (Trichinopoly, Madras, Berhampore, Cannanore, and Bangalore), and I noticed that in the list of Tranvancore snakes given by Ferguson in this Journal (Vol. X, p. 68, and Vol. XIV, p. 386), this is not mentioned as one of the 58 land snakes enumerated. In my whole Indian career (19 years), I have had one specimen brought to me, *viz.*, in Fyzabad, and only one sent to me for identification, except the examples that have reached me from our Secretary from around Bombay. It is poorly represented in numbers in both the British and Indian Museums. The fact, however, that Nicholson supports Jerdon in saying that it is fairly common in Mysore; and Mr. Millard tells me it is quite a common snake in the Konkan, added to the fact that it is often mistaken for the cobra in the Konkan, and has a fairly wide distribution in Peninsula India justifies its inclusion in these papers.

It occurs in Northern Ceylon. In India it is found from Cape Comorin to the base of the Himalayas, excepting, perhaps, Travancore. It does not extend as far as Rajputana and the Punjab on the north-west, nor further east than Calcutta. I have elsewhere* given good reasons for doubting the accuracy of the locality of Cantor's specimen in the British Museum said to be from the Province Wellesley in the Malay Peninsula. The exact localities known to me are shown in the accompanying map.

*Lepidosis.*—*Rostral*—Touches 6 shields; the rostro-internasal sutures usually greater than the rostro-nasal. *Internasals*—Two; the suture between them two-thirds to three-fourths that between the præfrontal fellows, about two-thirds the internaso-præfrontal suture. *Prefrontals.*—Two; the suture between them subequal to the præfronto-frontal sutures; in contact with internasal, postnasal, loreal, præocular. *Frontal*—Touches 8 shields; the fronto-supraocular sutures about twice as long as fronto-parietals. *Supraoculars*—Length subequal to frontal breadth about two-thirds the frontal along a line connecting the centres of the eyes. *Nasals*—Two; in contact with the first and second supralabials. *Loreal*—One. *Præoculars*—One touching, or almost touching the frontal. *Postoculars*—Two.

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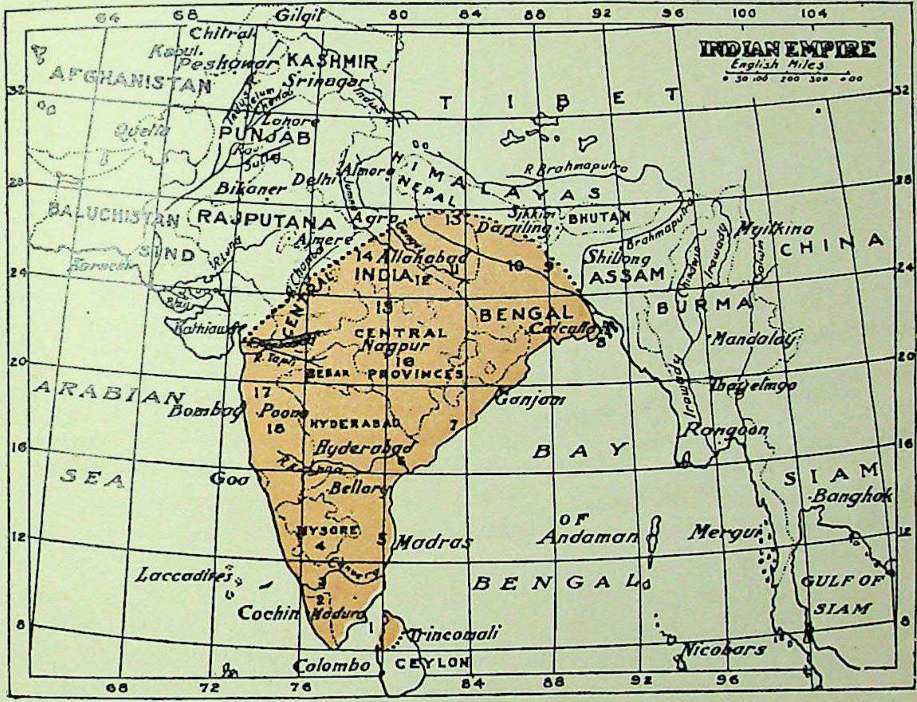
* Pois. Terr. Snakes, Brit. Ind. Dom. 1908, Footnote, p. 21.


INDIAN EMPIRE
English Miles
0 50 100 200 300 400
AFGHANISTAN
Gilgit
Chitral
Kabul
Peshawar
KASHMIR
Srinagar
TIBET
Quetta
Lahore
PUNJAB
Indus
Jhelum
Chenab
Ravi
Sutlej
Almora
HIMALAYAS
NEPAL
R. Brahmaputra
Bikaner
Delhi
BALUCHISTAN
RAJPUTANA
Agra
Sikkim
Darjiling
BHUTAN
Myitkina
CHINA
SIND
Karachi
Ajmere
14 Allahabad
11
10
Shillong
ASSAM
CENTRAL INDIA
12
Kathiawar
15
BENGAL
Calcutta
8
BURMA
Irawadi
Mandalay
CENTRAL
Nagpur
16
PROVINCES
R. Tapti
BERAR
ARABIAN
Bombay
17
Poona
18
HYDERABAD
7
Ganjam
Thayetmyo
Rangoon
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BAY
SEA
Goa
Kistna
Bellary
SIAM
Bangkok
OF
MYSORE
4
5 Madras
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Mergui
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BENGAL
GULF OF SIAM
3
Cochin
2
Madura
1
Trincomali
Nicobars
Colombo
CEYLON
32
28
24
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12
8
64
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72
76
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84
88
92
96
100
104

(1) Jaffna (Willey. Spol. Zeylan, April 1906, p. 33), (2) Anamallay Hill (I.M.), (3) Collagelly Hills (I.M.), (4) Mysore (Nicholson, Ind. Snakes, p. 87), (5) Madras (B. M.), (6) Ellore (Blanford, I. A. S. B. XLVIII, p. 115), (7) Vizagapatam Dist. (B. M.), (8) Calcutta (I. M.), (9) Monghyr (I. M.), (10) Patna (F. W.), (11) Benares (B. M.), (12) Allahabad (I. M.), (13) Fyzabad (F. W.), (14) Gwalior (B. M.), (15) Saugor (Bo. M.), (16) Nagpur (D'Abreu *in epistola*), (17) Salsette, Bombay, Thana, (Bo. M.), (18) Poona, Khandalla (Bo. M.)

B. M., implies British Museum; I. M., Indian Museum; Bo. M., Bom. Nat. Hist. Society's collection; F. W., the author.

THE COMMON SNAKES OF INDIA.

*Temporals*—Two; the lower touching three supralabials (usually the 5th, 6th and 7th). *Supralabials*—8; the 3rd, 4th and 5th or 4th, 5th and 6th touching the eye. Either the 3rd or 4th usually divided and touching the eye. *Infralabials*—6; the 4th, 5th and 6th, or 5th and 6th only, touching the posterior sub-linguals; the 6th largest and in contact with 3 scales behind. *Sublinguals*—Two pairs; the anterior rather the longer, the posterior completely separated. *Costals.*—Two headslengths behind head 21, midbody 23, two headslengths before vent 17. In the step from 21 to 23, a row appears on each side of the vertebral; in the reduction from 23 to 21 the two rows next to the vertebral unite; in the reduction from 21 to 19 (which occurs close to the preceding step, in fact, the absorption of rows in these two steps may be reversed), the 3rd above the ventrals is absorbed; in the reduction from 19 to 17, the 7th or 8th row above the ventrals is absorbed. Vertebrals not enlarged. No keels. Apical facets present in pairs.

*Ventrals.*—197 to 225. *Anal*—Divided. *Subcaudals*—73 to 92 in pairs.

*Dentition.*—(From a single skull in my collection). *Maxillary*, 13 subequal teeth, succeeded (after a gap that would accommodate one tooth), by two teeth little if any larger than the preceding ones. *Palatine* 11, decreasing in length from before backwards, the anterior subequal to the maxillary. *Pterygoid* 15 to 16, decreasing in length from before backwards. *Mandibular* 18, decreasing in length anteriorly, and posteriorly from about the 5th. I think the dentition is sufficiently distinctive to dissociate this species from the genus *Zamenis* in which several species with various dental characters are now grouped.

I take the view in this paper and for the reasons specified in a footnote that the forms of *Zamenis* described under the names of (1) *ventrimaculatus* (Gray), (2) *rhodorhachis* (Jan.), (3) *ladacensis* (Anderson), (4) *dorsale* (Anderson), and (5) *chesnei* (Martin), are all varieties of a single species for which the foremost name must stand having priority. Boulenger in his Catalogue (1893, Vol. 1, pp. 398 and 399) has already united Nos. 1 and 5, under the name *ventrimaculatus*, and Nos. 2, 3 and 4 under *rhodorhachis*, but distinguishes between these two*.

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* The descriptions of these two forms given by Boulenger in his Catalogue (1893) are identical with the exception of the ranges of the ventral, and subcaudal shields. I have now examined a large series of both forms from localities as widely separated as Almora in the East to Aden in the West. The dentition of all these agrees with that of the type of *ventrimaculatus* in the British Museum and the type of Anderson's *ladacensis* in the Indian Museum which I have also examined. I can discover no differences in lepidosis (examining specimens of each most critically side by side) except in the ranges of the ventrals and subcaudals. In one form both are more numerous than in the other. This becomes more noticeable in a comparison of the aggregates of these shields. Specimens of each agree in colouration, and they appear to grow to a similar length. I have examined the

## *ZAMENIS VENTRIMACULATUS* (GRAY).

### GRAY'S RAT-SNAKE.

*History.*—First referred to by Gray in 1834, who figured it in his Illustrations of Indian Zoology (Plate LXXX, Vol. II). The type specimen collected by General Hardwicke is in the British Museum, but the locality where found has been lost sight of. It is one of the few shielded forms. (Ventrals 206, subcaudals 98, Boulenger.) Under the name *Z. chesnei* Martin redescribed it in 1838. It has been redescribed under various other names, or confused with other species by many other authors.

*Nomenclature*—(*a*) *Scientific.*—" Ventrimaculatus " is from the Latin and implies spotted belly, in allusion to the irregular series of roundish spots seen at the edge of the ventrals in the forepart of the belly.

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geographical distribution of each and append maps which show that their distribution is almost the same. One (the few shielded) extends South of the Indus whilst the other has not yet been recorded so far South in India. A list is also appended showing the number of specimens of each that I have examined and added to the specimens in Boulenger's Catalogue and the ventral and subcaudal ranges. I think from these considerations most herpetologists will hesitate to accept these forms as distinct species. In this paper, therefore, I treat them all as one species under the name *ventrimaculatus*.

SYNOPSIS OF SPECIMENS.

| — | No. of examples. | Range of ventrals. | Range of subcaudals. | Aggregate of foregoing. | Locality. |
|---|---|---|---|---|---|
| | | *Variety* | *Typica.* | | |
| Few shielded .. .. | 6 | 199-210 | 82-112 | 281-321 | Persia. |
| Many do. .. .. | 13 | 214-241 | 126-137 | 341-376 | |
| Few shielded .. .. | 2 | 207-209 | 109-112 | 316-331 | Aden and around. |
| Many do. .. .. | 10 | 222-236 | 124-138 | 346-372 | |
| Few shielded .. .. | 17 | 194-211 | 95-121 | 295-326 | Sind, Baluchistan. Thar and Parkar. Rajputana, Punjab. |
| Many do. .. .. | .. | .... | .... | .... | |
| Few shielded .. .. | 18 | 190-221 | 101-125 | 293-335 | W. Himalayas, from Almora to Gilgit. and Chitral. |
| Many do. .. .. | 10 | 216-246 | 126-145 | 347-391 | |
| | | *Variety* | *rhodorhachis* | *(Jan.)* | |
| Few shielded .. .. | .. | .... | .... | .... | Persia. |
| Many do. .. .. | 6 | 217-238 | 125-137 | 347-363 | |
| Few shielded .. .. | 2 | 211-222 | 111-122 | 322-344 | Chitral. |
| Many do. .. .. | .. | .... | .... | .... | |

(*b*) *English.*—For want of a better title, and owing to the difficulty of finding anything distinctive in this member of a large genus, I propose to associate Gray's name with it.

(*c*) *Vernacular.*—According to Captain Shakespeare who sent 7 young specimens to our Society's collection from Koweit on the Persian Gulf it is called "dawaib-al-khail" in Arabia.

*Identification.*—The scale rows two headslengths behind the head are 19, in midbody 19, and two headslengths before the vent 15, or more commonly 13. The anal shield is divided. The supralabials are 9; the 4th divided and the 4th, 5th and 6th touching the eye (less commonly they are 8; the 3rd divided and the 3rd, 4th and 5th touching the eye).

There are only about 12 others of our Indian snakes with the scale rows as given above. 6 of these have an entire anal shield, and none have the condition of the supralabials peculiar to this species. The divided 3rd or 4th supralabial must be carefully looked for (*see* figure).

*General characters.*—This is a remarkably graceful species, the body is smooth on the surface, round, slender and elongate, and the tail is unusually long, and tapering accounting for more than one-fourth the total length. The head is moderately narrow, and the snout moderate in length, and obtuseness. The nostril occupies about the upper two-thirds of the suture between the nasal shields. The eye of medium size has the pupillary border of the iris fine specked with gold, so that the round shape of the pupil is clear evident in life. A neck is moderately evident. The attenuation of the body is very gradual, and continues so insidiously that the origin of the tail is barely if at all indicated. The belly is slightly angulated on each side.

*Colour and varieties.*—The variety *typica* of Gray, and far the commonest variety is very variable in its prevailing tones and markings. It may be dirty yellowish, olive-greenish, olive-brownish, stone coloured, or greyish. The posterior part of the body for a variable length, and the tail are uniformly coloured. Anteriorly the body is variously marked with spots, or crossbars, or both. A common form is shown in our plate where crossbars are evident, alternating with a single series of largish costal spots. These bars may be as long as the intervals, as in our plate, or only half the length. In another very common form there are no crossbars, but 5 or 6 rows of small spots arranged quincuncially. In some 3 series of small spots alternate with one another each side, and the uppermost with a series of narrow crossbars. The head partakes of the prevalent dorsal hue, and exhibits a blackish spot on the lore, a blackish oblique stripe below the eye, another on the temporal region to the gape, a band between the eyes, and varioas marks on the occiput. A crossbar, or a single longitudinal stripe, or twin stripes may be present on the nape. These very variable marks are obscure, or more or less obsolescent in some specimens especially old ones. but are quite conspicuous in the young. In a large number of examples there is a conspicuous, white, or buff zone around the eye. The belly in life is saffron yellow, or a paler shade, sometimes merging to pinkish posteriorly, or exhibiting a pinkish suffusion laterally. A more or less irregular series of black spots occurs at the edges of the ventrals beyond their angulation.

In the specimens I saw in life in Chitral the skin was dun coloured, and the scales in the anterior part of the body were black on their basal margins and pale yellowish or whitish on their apical margins where overlapped. This produced a beautiful variegation chiefly visible when the snake inflated itself under excitement. This variety is the prevailing one in India, in Chitral, Sind, Baluchistan, Persia, Arabia, and N. W. Africa.

Variety *rhodorhachis* (Jan) (From the Greek "rhodos," a rose and "rachis," the spine.) This variety which is far less abundant than *typica* is characterised by a reddish stripe down the spine which in some specimens is a brilliant vermillion, in others a vivid rose, and in others a brownish, or rusty red. It may involve from 3 to 5 scales in the breadth of the snake, and commencing at the nape may extend to the tail tip, or end at the vent, or sometimes before midbody. In other respects this form is marked as in *typica*, but I think all the specimens I have seen showed the quincunciate arrangement of small spots, and none any crossbars. I have seen the red spinal stripe very limited in extent, and but faintly indicated, and such specimens are completely intermediate between the forms *typica* and *rhodorhachis*.

There are specimens in the British Museum from Persia, and I have seen specimens from Chitral and from Aden Hinterland (Dthalla).

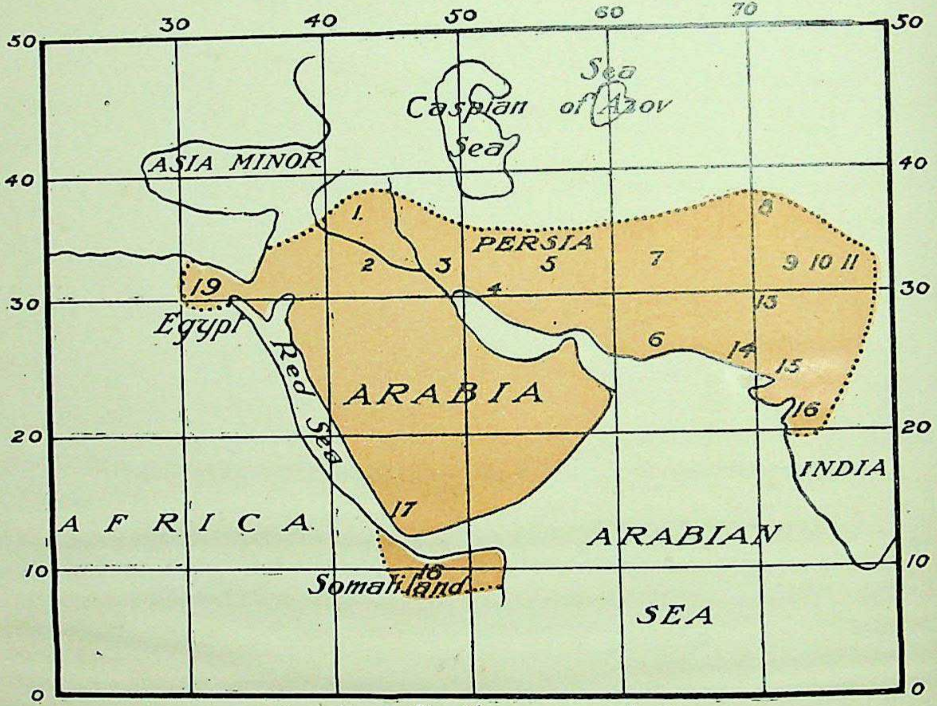
Variety *subnigra* (Boettger) uniform slatish in the anterior part of body, merging to purplish brown posteriorly. A narrow blackish mesial line on the neck expanding gradually and merging to purplish-brown so as to suffuse the entire dorsum. A few black spots costally. Head olive-greyish. Belly yellow beneath the neck, merging to purplish-brown behind, and with the usual black spots at the sides of the ventrals. Described by Boettger from an example from Somaliland, also recorded by Boulenger from the Abian Country, Arabia.

I have seen a uniformally blackish specimen from the Aden Hinterland (Dthalla) which I considered a melanotic example. (Ventrals 231, subcaudals 138).

*Dimensions.*—Adults usually measure from three to four feet. The largest specimen I have seen which had its tail slightly imperfect was a ♂ which taped four feet, and half an inch in the fresh state.

## MAP 1.

Distribution of the few-shielded variety (Ventrals 199—222. Subcaudals 82—122. Aggregate 281—344).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AFRICA
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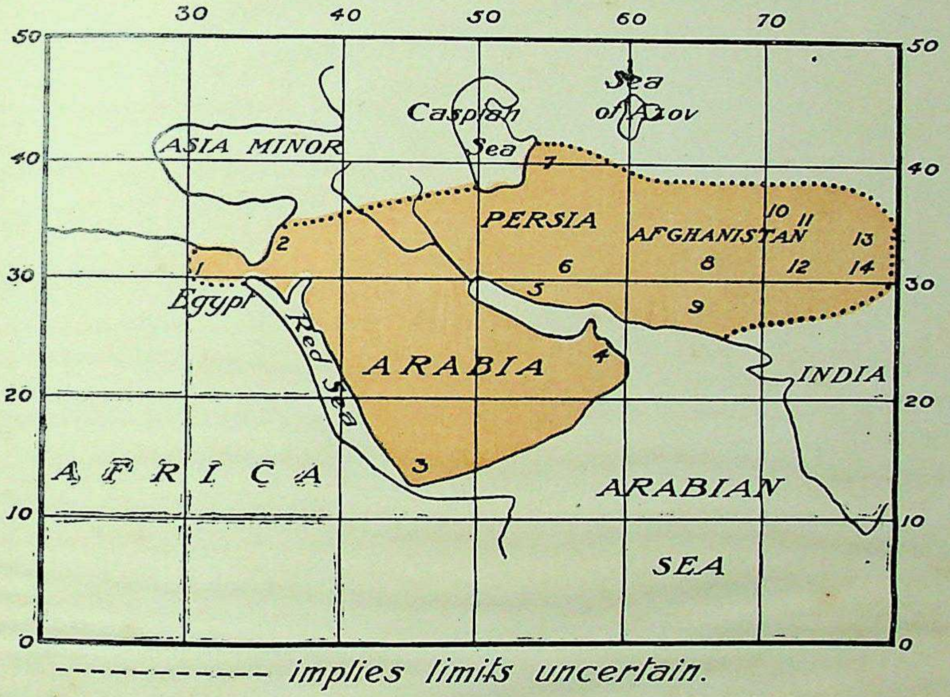
---------- implies limits uncertain.

(1) Mesopotamia (B. M.), (2) Euphrates (B. M.), (3) Fao (B. M.), (4) Bushire (B. M.), (5) Persia (B. M.), (6) Gwadar (B. M.), (7) Afghanistan (B. M.), (8) Chitral (F. W.), (9) Lahore (Bo. M.), (10) Mussoorie (Bo. M.), (11) Almora (F. W.), (12) Delhi (F. W.), (13) Hyderabad (Bo. M.), (14) Karachi (B. M.), (15) Deesa (Bo. M.), (16) Deolali (Bo. M.), (17) Aden Hinterland (Bo. M.), (18) Somaliland (Boettger), (19) Egypt (Murray, Vert. Zool. Sind, p. 378).

49,189

# MAP 2.

Distribution of many-shielded variety (Ventrals 214—246. Subcaudals 124—145. Aggregate 341—391).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Sea of Azov
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ARABIA
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AFRICA
ARABIAN SEA
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------------ implies limits uncertain.

(1) Egypt (B. M.), (2) Dead Sea (B. M.), (3) Aden Hinterland (B. M.), (4) Muscat (B. M.), (5) Bushire (B. M.), (6) Shiraz (B. M.), (7) Transcaspia, (B. M.), (8) Baluchistan (B. M.), (9) Regan (B. M.), (10) Chitral (F. W.), (11) Gilgit (B. M.), (12) Punjab (Bo. M.), (13) Ladakh (Anderson), (14) Kasauli (Bo. M.)

B. M., implies specimen is in the British Museum; Bo. M. in our Society's collection at Bombay; F. W., the author's authority.

*Haunts.*—The many specimens brought to me in Chitral, Malakand and Delhi were encountered on the hill sides or in open spaces, or cultivated ground. There is no jungle worth the name in those localities, and I think the same may be said of most of the countries it inhabits. Several were killed inside our very congested little fort at Drosh, and another inside the mess at Chitral where it was seen in the roof. Another was killed in a house at Malakand where I think it was seeking retirement for the winter. Major Magrath tells me too that it is common about bungalows in Cantonment in Peshawar.

*Habits and disposition.*—I have met a good many during the day time, either basking in the open close to cover into which they quickly withdrew on my approach, or I disturbed them in the act of swallowing a victim. On one occasion the victim which had been swallowed proved so bulky that it seriously handicapped the snake's movements, and it could not in consequence evade capture. It is probably about at night too sometimes since it preys on Stoliczka's gecko, a lizard I never saw except after dark. It is a very active snake, but so far as a very limited experience of living specimens is concerned I do not think it is fierce or aggressive. Alcock and Finn who collected many specimens on the Perso-Baluch border also remark that it is not fierce. Many specimens I was unable to catch owing to the precipitate manner in which they disappeared on my approach, and one that I liberated went off so hurriedly that I had great difficulty in recovering it.

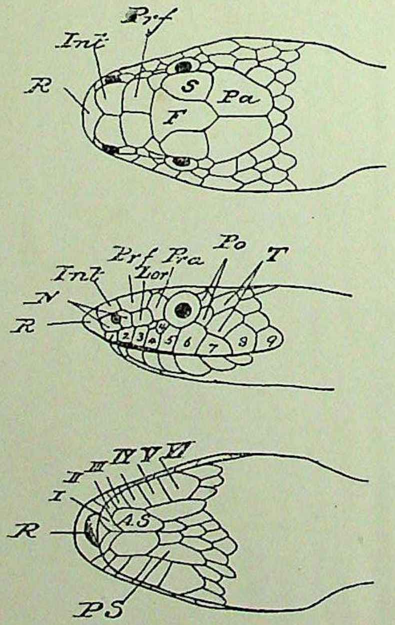
*Food.*—On three occasions I found a lizard of the genus *Calotes* had been taken. Twice this was the species *versicolor*, and on the third occasion probably the same species. Twice I found Stoliczka's gecko *Gymnodactylus stoliczkæ* had furnished the meal.

*Breeding.*—My three gravid specimens were captured in May and June, so that it is probable that mating occurs in the early spring, soon after they emerge from hibernation. The smallest dam was 2 feet 11 inches, a length which would be attained by about the end of the third year of life. There were 3 eggs in one, 8 in another and 9 in the third, so that the species cannot be considered prolific. The largest eggs which measured from one, to one and a half inches in length, contained no trace of an embryo, so that it seems probable that the snake is oviporous, and that the embryo does not begin to develope until after oviposition. The hatchlings probably emerge from the egg in August and September. I have had young specimens measuring 12$\frac{7}{8}$ and 13$\frac{1}{4}$ inches in September. The ♂ claspers in adults are studded with hook-like horny appendages. The secretion of the anal glands is white, and looks like white paint.

*Growth.*—The smallest specimen I have any record of is the one mentioned by Stoliczka captured at Sobattoo which measured 11$\frac{1}{2}$ inches, and I think this will prove to be about the length of a newly hatched specimen. As far as I can judge the species appears to grow about 10 or 12 inches each year until mature, *i.e.*, about the end of the third year, but like other snakes they will grow considerably after attaining sexual maturity.

*Distribution.*—It has been found in the Indian Tropical Region in the Konkan, (Bombay, Poona, and Deolali), on the confines of the Tropical Region, [Deesa, (B. N. H. S. Collection), Jeypore (Sclater), and Delhi (F. W.) ], but otherwise only in the Mediterranean subregion of the Holarctic (Sind, Rajputana, Punjab, Western Himalayas, (West of Almora,) Kashmir, Chitral, Afghanistan, Baluchistan, Persia, Transcaspia, Mesopotamia, Arabia, Egypt and Somaliland). It is common everywhere on our N. W. Frontier. Major Bukhle tells me it is abundant at Sukkur, Sind. Alcock and Finn found it frequently on the Perso-Baluch boundary, and I have examined many specimens from Baluchistan. In the Aden Hinterland it was one of the commonest snakes met with. It is evidently plentiful in Persia judging from the many specimens in various Museums from that country.

*Lepidosis.*—*Rostral.*—Touches 6 shields, the rostro-nasal sutures larger than the rostro-internasal. *Internasals.*—Two; the suture between them rather less than that between the præfrontal fellows, subequal or rather less than the internaso-præfrontals. *Præfrontals*—the suture between them, rather greater than the præfronto-frontal; in contact with internasal, postnasal, loreal and præocular. *Frontal*—Two; touches 8 shields; the fronto-supraocular sutures twice or more than twice the fronto-parietals. *Supraoculars*—About as long, and as broad as the frontal. *Nasals;*—Two, in contact with the 1st and 2nd supralabials. *Loreal*—One; longer than high. *Præocular*—One; touching frontal. *Postoculars.*—Two. *Temporals*—Two; the lower in contact with 3 supralabials (usually the 6th, 7th and 8th). *Supralabials.* Usually 9; the 4th divided and the 4th, 5th and 6th touching the eye (sometimes 8; the 3rd divided and the 3rd, 4th and 5th touching the eye). *Infralabials*—Six; the 6th largest and in contact with 3 scales behind normally. *Sublinguals*—Two pairs; the posterior longer, and in contact with the 5th and 6th infralabials, quite separated by small scales. *Costals*—Two headslengths behind the head 19, in midbody 19, two headslengths before the vent 13. In the reduction from 19 to 17, the 3rd or 4th row above the ventrals is absorbed, in the second step from 17 to 15 the two rows next to the vertebral coalesce; and from 15 to 13 the two rows next to the vertebral again fuse. As the first two steps occur close together, they are sometimes reversed, or intermixed. Keels absent. Apical facets in pairs. *Ventrals*—Angulate laterally. In the few shielded "form" 190 to 222; in the many shielded 214 to 246. *Anal*—Divided *Subcaudals*—In the few shielded "form" 82 to 125, in the many shielded 124 to 145.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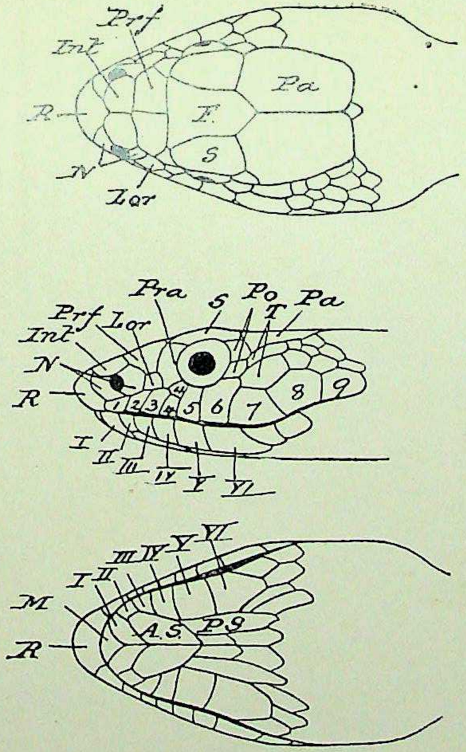
Zamenis fasciolatus ($\frac{1}{1}$)

| | |
|---|---|
| A. S. | Anterior Sublinguals. |
| F. | Frontal. |
| Int. | Internasals. |
| Lor. | Loreal. |
| M. | Mental. |
| N. | Nasals. |
| Pa. | Parietals. |
| Po. | Postoculars. |
| Pra. | Præoculars. |
| Prf. | Præfrontals. |
| P. S. | Posterior Sublinguals. |
| R. | Rostral. |
| S. | Supraocular. |
| T. | Temporals. |
| I.—IX. | Supralabials. |
| I.—VI. | Infralabials. |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Zamenis ventrimaculatus

(× 2)

The Common Snakes of India.

*Dentition.*—From 7 skulls in my collection, including Variety *typica*, Karachi (Ventrals 201 + 114), Variety *typica*, Chitral (Ventrals 239 + 136), Variety *rhodorhachis*, Chitral (Ventrals 215 + 113), Variety *typica*, Sukkur (Ventrals 204 + 121). *Maxillary* 10 to 14, slightly increasing backwards, then a gap that would accommodate two teeth followed by a pair of obliquely set, enlarged teeth. *Palatine*, 9 to 11, the median about as long as the median maxillary, slightly decreasing forwards and backwards. *Pterygoid*, 15 to 24, gradually decreasing backwards. *Mandibular* 15 (14 ?) to 20 (21 ?), the first 3 or 4 progressively increasing, the posterior gradually decreasing.

*Plate.*—Our illustrations are good, and show one of the commonest colour forms. This Plate also contains three figures of another member of the genus *Zamenis*, which will be discussed in the next paper.

(*To be continued.*)

# NOTES ON THE INDIAN TIMELIIDES AND THEIR ALLIES

## (LAUGHING THRUSHES, BABBLERS, &c.).

BY

MAJOR H. H. HARINGTON, Indian Army.

Having spent a considerable portion of my leave working through that interesting group of birds—the Indian *Timeliides*—and in so doing collected together a large mass of notes; I venture to publish these, as a great number of birds new to the Fauna of India, have been added since Mr. Oates published his admirable work on the birds of India.*

The descriptions of these new species have appeared from time to time in various Journals and Bulletins, which are not always available to residents in the East. I hope, therefore, by republishing these descriptions, I shall at least be of some assistance to others who have been unable to procure them.

I have also made an attempt, not altogether successfully, to bring some sort of order into this very complex group of birds. My first and chief difficulty has been to know what birds should be admitted into the *Timeliides*, as I have been unable to find any definition giving their characteristics. Mr. Oates in his "*Crateropodidæ*" included a great number of Families and Genera which are now not considered to belong to the *Timeliides*, many of these have been placed in other Families by Dr. Sharp in his "Hand List." There, however, still remain several Genera which I consider should be removed from this sub-order.

The nearest definition of the characteristics of the *Timeliides*, I can find is that given by Jerdon.† This unfortunately does not cover all the Genera which are at present included in this sub-order.

"Legs and feet stout and large; bill various in form and length almost always compressed, usually notched; wing short and rounded; tail longish, graduated; plumage often lax." (Jerdon.)

From the above I have presumed to formulate the following, which I hope covers all those I consider should be included within the *Timeliides* :—

> Wings, short and rounded; powerful legs and feet, suitable for progression on the ground; shape of bill, and length of tail, very variable; plumage of the young not markedly different from that of the adult; non-migratory in habits; and no seasonal change in plumage.

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* "Birds" Fauna of British India.

† Jerdon "Birds of India". Vol. ii., p. 1 (1863).

The *Timeliides* as above constituted are strictly non-migratory and very sedentary in their habits, living the whole year round practically in the same locality.* They have no distinctive summer and winter plumage, which at once separates them from the Warblers. Very little appears to be recorded about the plumage of the young, which however is generally very like that of the adult; they have, however, no distinctive plumage, differing from that of the adult, like the majority of the Thrushes (*Turdidæ*), this at once removes them from that family.

### TRINOMIALS.

" As the use of trinomials for sub-species—or better, geographical or local races—does not seem to be generally understood, it may be explained that when a species is divided into two or more races, or when two or more species are grouped as races of one species, then each of these races must have a trinomial appellation. It is impossible to say which is the oldest or parent form, therefore the first-named race of all those grouped under one species is arbitrarily taken as the typical race, and its name becomes that of the species."

" It cannot be gainsaid that the trinomial system is of the greatest possible use scientifically as demonstrating the close relationship of geographical forms of the same species, just as the binomial system demonstrates the relationship of species of the same genus."†

As the use of trinomials is possibly new to a great number of Members of the Society, I have given the above definition from "The Hand List of the British Birds", which explains their use and advantage very much better than I possibly could.

Mr. Oates in the "Fauna of India " did not always take notice of geographical races, some he considered distinct species, whilst others he treated as local forms, only just mentioning the differences which occur between them and the typical species he was describing. So that, often from his descriptions it is impossible to tell whether the bird he is actually describing is quite distinct from any other species, or only differs in some minor detail.

For example, in the Chestnut-headed Laughing-Thrushes ( *T. erythrocephalum*, *nigrimentum*, *chrysopterum*, *erythrolæma*, *melanostigma*, etc.), there is nothing in Mr. Oates' descriptions, which tells at a glance that all these birds are really only the geographical races of one species, and merely differing from each other in some small detail, such as the colour of their ear-coverts, supercilium, etc. By the use of trinomials, it at once becomes apparent that all these different birds are nothing but the geographical representatives of one species, which is very widely distributed in the hills, extending from the N. W. Himalayas to the Malay Peninsula.

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* Capt. C. H. T. Whitehead informs me that the local form of *Trochalopterum lineatum*, inhabiting the hills in the vicinity of Kohat, during the cold weather descends down to the lower ranges, this can hardly be called true migration, it is very interesting, and probably the same local movement takes place amongst other species inhabiting bare and open hills.

†"A Hand List of British Birds," Hartert, Jourdain, Ticehurst and Witherby, 1912.

I have therefore taken full advantage of the use of "trinomials" to show, wherever I consider a relationship exists. The great majority of the birds so dealt with have been looked on as "good species", and doubtless, so they are, when only a few specimens from different localities are compared. However, when a large series of allied species are examined it will be found, that they either grade into each other, or show such a strong family likeness, that the presumption is that the connecting links exist, or have existed, and by the use of trinomials this relationship is at once apparent.

Some may, however, consider that I have used "trinomials" rather too freely, and that their use should be reserved to denote sub-species or local forms not worthy of specific rank. It is often extremely difficult to say which are "good species," or which are only a "local forms," when you find both occupying well marked areas.

By the use of trinomials, I do not wish to degrade a bird from specific to sub-specific rank, but only to show that they are the geographical representatives of a certain species, and have been guided by the rule that no two sub-species of the same bird can be found inhabiting the same area.

## DISTRIBUTION.

*The Timeliides* appear to me, to be of very recent origin, and still in a state of evolution; they are resident and non-migratory and consequently a great many species have developed into numerous geographical races.

Their central stronghold seems to be about Burma, from whence they have extended through Assam into India and the Island of Ceylon,* eastwards they are found in China, Japan, and the Islands of Formosa and Hainan. An astonishing number of birds from these two Islands show a marked relationship to the Himalayan Fauna, indicating, I think, that these islands must have been connected with the mainland up to a very recent date. Southwards they extend down the Malay Peninsula to the numerous islands, in fact, throughout the Oriental or Indian Region, and I think that the sub-order *Timeliides* should be restricted to birds of this Region, and not thrown open to all the waifs and strays of the bird world, so that it has become a veritable "Ornithological Waste-paper Basket."

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* Some Ceylon and S. Indian birds, such as *Pomatorhinus*, *Arrenga* and others show a marked affinity to the Sumatran and Javan Fauna, possibly showing some former land connection in this direction.

A very interesting fact, which I have not seen mentioned before, is that although the *Timeliides* are so well represented in Burma and Malay States, none have been recorded from the Andaman and Nicobar Islands, obviously showing that these islands must either be of recent formation, or had no connection with the mainland since the appearance of this very large sub-order birds.

Whilst working up the distribution of this fascinating group, I was greatly struck by the manner in which species in certain localities were liable to variation. I soon found that by taking specimens and grouping them according to these different localities, any differences at once became apparent. In the hills these areas are more or less well marked, in the plains the distribution is not so easy, or my knowledge of the physical geography at fault.

For some unaccountable reason, some species extending over a wide area, seem to take every opportunity to vary, so we find geographical races, wherever there is any isolation. Whilst other species occupying practically the same area, show hardly any variation whatever.

All birds are more or less restricted to certain elevations, some being entirely " Plains-dwellers," never ascending the hills to any great height, whilst others are only found in the hills at certain altitudes. A very curious fact, which I have never seen accounted for, is the remarkable way in which, certain birds are only found at great heights in the Himalayas, occur at much lower levels in Assam and Burma.

It is also a well-known fact that species inhabiting both a very dry and a damp locality differ in colour. Birds from the former being paler, whilst those from the latter are darker and more highly coloured.

Another interesting fact noticed is that amongst species liable to variation and which have a wide distribution (and represented by numerous races) very often the sub-species furthest apart geographically, that is at the ends of the chain or extremities of the " horse-shoe " resemble each other far more closely than those near together and often are hardly separable.

This is well illustrated in the " Scimiter-Babblers." *Pomatorhinus erythrogenys erythrogenys*, Vigors, from the N. W. Himalayas, is only separable in size from *P. e. imberbis*, Salvadori, from Tenasserim; (both these races are noticeable for having pure white unstriped breasts). Intervening we have the following well-marked sub-species, *P. e. ferrugilatus*, Hodgson, from Sikhim, which has the breast almost entirely grey: in Assam *P. e. macclellandi*, Jerdon, and in Yunnan and North-East Burma *P. e. gravivox*, David, both of of which have boldly striped breasts; and no doubt, connecting links exist grading from one sub-species into the other, showing that there is really only one species, which is represented by well-marked geographical races or sub-species over the extent of its distribution.

A great number of birds which are found both in Southern India and Lower Burma are very similar, and often hardly separable. *Pellorneum ruficeps ruficeps*, Swainson, and *Alcippe phæocephala phæocephala*, Jerdon, both from Madras, and at one extremity of the "horse-shoe" are very like *P. r. subochraceum*, Swinhoe, and *A. p. phayrei*, Blyth, from Lower Burma and Tenasserim, at the other extremity, while separating them we have well marked races. Many other interesting examples might easily be given, Mr. Stuart Baker has also noticed the same fact whilst working at the Game Birds and Pigeons.

These same unknown reasons might also account for the numerous cases of similarity or "mimicry" which exist between birds of totally different genera and orders, such as between *Mixornis rubricapillus*, Tickell, and *Stachyrhidopsis ruficeps* (Blyth), which from their coloration are only separable after careful examination. *Dicrurus ater*, *Crypsirhina varians* and *Surniculus lugubris* (the King-crow, Black racket-tailed Pie, and the Drongo-cuckoo) can all be very easily mistaken for each other.

The distribution of the "Plains Dwellers" is naturally restricted by mountain ranges and desert tracts, whilst that of Hill birds appears to be limited by certain great river valleys. This is most marked in what may be called the "Assam Back-water." Here we find in the same Province many birds from one side of the river are quite distinct from those of the other, some sub-species, from the Dafla Hills to the North of the Brahmaputra being quite distinct from those from the Garo, Khasia and Cachar hills, situated to the South of the river.

I do not wish to imply that each area has its own special breed of birds, but if there is any variation in a species, these differences will probably occur within certain well-marked tracts. I may possibly be wrong in my different areas as I only came to the following conclusions, from studying specimens and not from any local knowledge, except in the case of Burma.

In the Himalayas, we find the following rivers forming very natural boundaries, the Indus, Sutlej and Brahmaputra. In Burma in a less degree we still have small rivers marking well defined areas. In this Province the most noticeable barrier is the "dry-zone" of Central Burma, which effectually separates Northern Burma from Lower Burma, and the Chin Hills on the West from the Shan Hills on the East.

## INDIA.

Commencing at the N.-W. we have the following well-marked areas:—

1. *Trans-Indus.*—Probably from the right or West bank of the

Kabul river through the Afridi country down to Baluchistan. This tract is very noticeable for its poverty in *Timeliine* birds, and for the great number of Palæarctic forms which occur.

2. *N.-W. Himalayas.*—From the Indus to the Sutlej valley, which includes the southern portions of Kashmir and Chamba State (N. Kashmir is probably Central Asian and Tibetian). Here we find the *Timeliides* better represented, however many well-known families have not yet found their way across the Sutlej valley.

3. *Nepalese.* —From the Sutlej to the Brahmaputra, and includes the following sub-regions: (1) Gharwal and Kumaon. (2) Nepal. (3) Sikhim and Darjeeling. (4) Butan and Dafla Hills, Assam.. This region is particularly rich in the *Timeliides*.

4. *Tibet.*—Practically unknown.

5. The practically unknown tract, East of the Brahmaputra, along Abor, Mishmi, and Patkoi ranges, down on the one hand to the Chin Hills, North of Tamu; and on the other to Yunnan.

6. *The Assam "backwater."*—The country to the South of the Brahmaputra, including the Garo, Khasia, Cachar and W. Manipur Hills.

The above areas are well marked, many of them having geographical races peculiar to themselves.

In the plains the distribution is not so clearly defined and may possibly comprise the following:--(1) In the West we have Sind, which seems to be particularly rich in birds, the *Timeliides*, however, being very poorly represented. (2) Punjab and United Provinces. (3) Bengal and the plains of Assam and Arrakan. (4) Rajputana. (5) Central Provinces, Deccan. (6) Madras and Mysore in the plain. (7) The Western Ghats, Travancore and the hills of S. India, here we find each range with its own particular Laughing Thrush. (8) Ceylon which also has its dry and wet-zones, the birds of which appear to differ considerably.

## BURMA.

This province is extremely rich in its Avifauna, on the West in the Chin Hills and Arrakan, we have chiefly Himalayan and Assam birds or their local sub-species, a few birds, however, showing a relationship to those of Yunnan. In the N.-E. we have Chinese; and in the S.-E. Malayan forms; whilst in the central plains we have a few birds peculiar to Burma itself. Commencing at the N.-W. and taking the hill ranges first, we have the following well-defined areas:—

1. *Chin Hills.*—From the South of Tamu (I have taken this to be the dividing line, as just at this point on the frontier between Burma and Manipur, the hills are of no great height, the dividing line is most probably the Yu and Manipur rivers). The Chin Hills here connect up with the southern ranges of Manipur, and continue

southwards in an unbroken ridge down to the sea, and divide Arrakan from Burma. The chief height in this range is Mt. Victoria of over 10,000 ft. To the northwards from Tamu, we have the unexplored mountains running up to the Mishmi and Abor country, in this mountain chain we have Saramathi of over 12,000 ft., which is quite unknown, as far as its ornithology.

2. *The Myitkyina and Bhamo Hills*—On the N.-E. of Burma, these are offshoots of the mountains of Yunnan, and contain a number of Chinese birds. This area is probably bounded on the South by the Shweli River.

3. *The Ruby Mines range*, which consists of that little known ridge of mountains which run up to over 8,000 ft., which extends from just below the point where the Shweli joins the Irrawaddy, through the Ruby Mines District, and in a N.-E. direction to the Salween. The southern limits of this unexplored tract is the low-lying plateau along which the Mandalay-Maymyo-Lashio railway line is laid. The birds of this vast tract are quite unknown and probably many new species will be discovered along this range.

4. *The Shan Plateau*, South of the above, and to the West of the Salween, and includes the Karennee sub-region. To the East the Salween—Mekong watershed is practically unknown.

5. The mountains of Tenasserim with Muleyit Mt.

*In the Plains.*

6. *Northern Burma*, which is a particularly damp low-lying area, may be said to consist of the Bhamo, Myitkynia and Upper Chindwin Districts, and North of about 23 N. parallel of latitude.

7. *The Dry-Zone*, South of the above to about 19½ N. parallel of latitude. This central portion of Burma consists of a very dry undulating country, and, where not cultivated, covered with dense thorny scrub.

8. *Lower Burma*, which is also extremely wet, is situated to the South of the above.

From the above well-marked areas or zones, it is not surprising that Burma is rich in its birds, while many of its outlying ranges still remain to be explored. Over one thousand different species and sub-species of birds have already been recorded from within the Province out of under seventeen hundred, which are known to occur in the whole of India and Ceylon.

## CLASSIFICATION.

I have followed Mr. Oates as closely as possible in his "*Craterpopodidæ*" with the following additions and omissions :—

### *Additions.*

*Paradoxornithidæ.*—I think it is now agreed that this family is more nearly allied to the *Timeliidæ* than to any other. It wants a great stretch of imagination to place the "Crow-Tits" amongst the Crows (*Corvidæ*), and they differ from the Tits (*Paridæ*) in many important particulars.

*Acanthoptila nepalensis*, Hodgson.—This little known bird is undoubtedly very closely related to *Argya* and *Babax*, and possibly forms a connecting link between these two genera. It shows this, in the formation of its bill and description of plumage, but chiefly in the colouration of its eggs, which are described as a "verditer-blue," this exactly applies to the colour of the eggs of Babblers, such as *Argya* and *Crateropus*, and a colour, I believe, quite unknown amongst the Warblers (*Sylvidæ*). Very little still appears to be known about this species. Mr. Oates' reasons for placing it amongst the *Sylvidæ* seem to have been that he considered it had both a summer and winter plumage. If *A. pellotis*, (Hodgs.) and *A. leucotis*, (Hodgs.), are one and the same species, which they undoubtedly are, it, therefore, has two phases of plumage, one of which shows a considerable amount of white. This is similar to *Gypsophila cripsifrons* (Blyth) and *Gampsorhynchus rufulus* (Blyth.), in which species the adults of both have a considerable amount of white, which is only assumed by slow degrees.

### *Omissions.*

*Brachypteryginæ.*—With the exception of *Elaphronis palliseri* (Blyth), the position of which is still uncertain, I have omitted the whole of this sub-family, as they undoubtedly belong to the *Turdidæ*, many species of which appear to have been refused admission to that family, solely because their young have advanced in a stage of evolution and have discarded their distinctive juvenile garb.

*Zosterops.*—Dr. Sharpe in his "Hand List" has given the "White-eyes" family rank under the title of *Zosteropodæ*. They have a very wide distribution; and their pointed wings and migratory habits at once removes them from the *Timeliides*.

*Æthorhynchus and Ægithina*, (Ioras).—Have been placed by Dr. Sharpe in the *Pycnonotidæ*. Both these genera have a summer and winter plumage, which at once separates them from the *Timeliides*.

*Chloropsis and Irena.*—Have both been placed in the *Pycnonotidæ* by Dr. Sharpe. They have remarkably short tarsi and fairly long wings, which removes them from amongst the Babblers.

*Brachypodinæ.*—The Bulbuls have rightly been removed from amongst the *Timeliides* and given family rank with the title of *Pycnonotidæ*.

*Melanochlora sultanea*, (Hodgson).—Mr. Stuart Baker has shown that both by its nidification and the colour of its eggs, the Sultan-Bird is a true Tit, and Hodgson was originally right, when he placed it amongst the *Paridæ*, to which family it has again been relegated by Dr. Sharpe.

*Cephalopyrus flamiiceps*, (Burton).—The Fire-Cap has also been placed amongst the *Paridæ*.

*Leptopoeceile sophiæ*, (Severtz.) has been placed by Dr. Sharpe in the *Regulidæ* (Goldcrests).

*Psaroglossa spiloptera*, (Vigors).—The Spotted-wing is undoubtedly very nearly connected with both *Sturnia* ( Small Tree Mynas ) and the Glossy Calornis (*Calornis chalybeius*, Horsfield) resembling the former in habits, notes and nidification, and the latter in colour of its eggs, which in both species are pale-blue spotted with reddish-purple. Spotted eggs are not unknown amongst the Mynas, this at once removes one of Mr. Oates' objections to placing it amongst the *Sturnidæ*.

*Hypocolius ampelinus*, ( Bonaparte ).—The Grey Hypocolius, Sharpe's Hand List IV, p. 275, has been placed in the *Prionopidæ*, which includes *Hemipus* and *Tephrodornis* (Wood-shrikes) from India.

I have raised the *Timeliides* to the dignity of a sub-order, and given family rank to the *Paradoxornithidæ*, *Craterapodidæ*, *Timeliidæ*, *Sibiidæ* and *Liotrichidæ*.

## ORDER—PASSERES.

### Sub-Order.—TIMELIIDES.

Wings short and rounded ; powerful legs and feet, suitable for progression on the ground ; shape of bill and length of tail very variable ; plumage of the young not markedly different from that of the adult ; usually non-migratory in habits ; and no seasonal change in plumage.

### Family—PARADOXORNITHIDÆ.

Sexes similar in plumage ; nostrils completely hidden by a profusion of feathers and plumes ; habits partly terrestrial, partly aboreal ; size chiefly small with one exception (*Conostoma*) ; wing short, rounded, fitting close to the body ; length of tail variable ; bill peculiarly short and thick.

### Family—CRATEROPODIDÆ.

Sexes similar ; nostrils not completely hidden by plumes or feathers ; habits chiefly terrestrial. Size medium ( about that of an English thrush ) ; wing short, rounded, and fitting close to the body ; length of tail, never shorter than the wing ; bill variable in size and shape.

### Family—TIMELIIDÆ.

Sexes similar ; nostrils exposed ; habits various ; some genera purely terrestrial, others arboreal ; size chiefly small ; wing short, rounded, and fitting close to the body ; length of tail and bill very variable.

### Family—SIBIIDÆ.

Sexes similar ; nostrils exposed ; habits strictly arboreal ; size medium ; wing moderately long ; legs and feet not particularly strong (this last characteristic should remove them from the *Timeliides* ).

### Family—LIOTRICHIDÆ.

*Sexes dissimilar* ; habits arboreal ; size small ; bill short ; wing and tail about equal (the majority, I think, should be removed from the *Timeliides*).

My thanks are due to the British Museum authorities for kindly allowing me to work through their splendid collection of birds, these notes being practically based on specimens in the Natural History Museum. My thanks are especially due to Mr. W. R. Ogilvie-Grant for his advice and assistance, more especially in working out many of the complicated keys. My thanks are also due to the Hon'ble Walter Rothschild and Dr. E. Hartert for allowing me to work through their valuable collection at Tring and for forwarding numerous species for comparison.

To Mr. E. C. Stuart Baker my thanks are due for many valuable notes and suggestions and to Mr. N. B. Kinnear for his assistance in preparing the manuscript for the press. Finally, I must apologise for the incompleteness of these notes; this is due in some cases to the want of material, and also to the fact that the notes have been made at home and put together out in India, where I have no books to assist or correct any mistakes which may have crept in.

My hope is, however, poor and wanting these notes may be, they will be of assistance to others.

I shall be extremely obliged if members will kindly point out any mistakes, and more especially if they will let me have any notes on this most interesting group of Indian birds. Very little is known about the plumage of the young of the *Timeliides*, which appear to be very like that of the adult, but in many cases seem to be slightly different. I, therefore, hope members so situated will collect series of birds and more especially those of the nestlings and young and send them in to the Society's Museum, which is also in want of adult birds. At some future date, I hope to revise this paper, and so will be extremely obliged if members will kindly point out any mistakes, and more especially if they will let me have or send to the Journal any notes on this most interesting group of Indian birds.

PESHAWAR, 5*th May* 1914. H. H. H.

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## PART II.

### Family—PARADOXORNITHIDÆ.

Legs and feet very large and strong, wings short, rounded, and fitting close to the body; sexes alike in plumage; bill short, stout, and culmen much curved; nostrils completely hidden by numerous soft feathers and plumes; plumage soft and lax; tail variable in length; non-migratory in habits; plumage of young presumably like that of the adult.

This family is rightly placed in the *Timeliides*, to which it undoubtedly belongs from its short, rounded wings, and powerful legs and feet. Mr. Oates' reasons for placing them amongst the crows (*Corvidæ*) appear to have been solely due to their concealed nostrils. Jerdon points out that too much importance should not be placed on the shape of the bill, a feature which is very variable in the *Timeliides*, some of which have short, straight bills, and others very long and curved ones; whilst some have numerous hairs overhanging the nostrils; in others the nostrils are quite free. I think it requires a very great stretch of imagination to place the Crows, Tits (*Paridæ*) and *Paradoxornithidæ*, all within the same family, solely because their nostrils are completely hidden, and ignoring the great difference in habits, nidification and all other structural differences.

I consider, therefore, Mr. Oates' name of "Crow-Tits" rather a misnomer, and propose "Parrot-billed" from the shape of their bills. There is always a great difficulty in giving suitable English names to birds quite distinct and totally different to the European Fauna; and, I think, something should be done to give names more appropriate than those now existing.

Very little appears to be known about the habits of this very compact family, the nidification of those of which we are acquainted with, form a very useful aid to their classification, and when that of the remainder is known, we shall probably find that each genera is well marked by the colour of its eggs.

The "Parrot-billed Babblers" are confined to the East and N.-E. of the Indian Empire extending from Nepal and Sikhim into Tibet and China, also occurring throughout Assam, Burma and the Islands of Formosa and Hainan, the great majority being only found at a considerable elevation in the hills.

With the exception of *Conostoma*, all the genera grade into each other, having very much the same structural peculiarities, differing *inter se*, chiefly in the size, shape of the bill, and length of tail.

I have for the present kept to Mr. Oates' classification, but consider Jerdon was right in keeping the following separated *Heteromorpha*, *Chleuasicus* and *Suthora*. Undoubtedly, all three have the same characteristics, they, however, differ greatly in size and colouration; and, I think, by keeping them separate, the study of the family would be greatly facilitated, as the above-mentioned genera consist of three very distinct types of birds.

The generic name *Scæorhynchus*, Oates, is already pre-occupied and in its place *Psittiparus*, Hellmayer, 1903, has been proposed.

I also propose the generic name of *Neosuthora* with *N. davidiana* (Slater), as type. This genus differs from Suthora in having an extremely short tail, and much deeper bill, and approaches *Psittiparus* very much in these respects, differing only in size.

I have divided the *Paradoxorinthidæ* into two sub-families—

(1) *Conostoma*, which consists of only one species, remarkable for its larger size and longer bill.

(2) *Paradoxornithinæ*, all of which have remarkably short, thick bills, and, I think, as mentioned before, should be divided into the following genera:—

(*a*) *Paradoxornis*; (*b*) *Heteromorpha*; (c) *Chleuasicus*; (*d*) *Suthora*; (*e*) *Psittiparus*; (*f*) *Neosuthora*.

## CONOSTOMA, Hodgson, 1841.

This genus contains only one species, which is the largest of the order. It has the following characteristics; tail slightly longer than the wing and not very graduated; a short rounded wing, the first four primaries graduated, the fifth, sixth and seventh equal and longest; nostrils completely hidden by numerous soft feathers (not stiff bristles); bill stout and fairly long, and not short and greatly curved like the other genera of this order; rictal bristles well developed; no hairs overhanging the nostrils; legs and feet stout, hind claw long and thick.

### CONOSTOMA ÆMODIUM, Hodgson.

*The Red-billed Jay-Thrush.*

Hodgson, J. A. S. B., x., p. 857 (1841); Sharpe, Cat. B. M. vii, p. 485; Oates, F. B. I., i., p. 61.

Description as in Oates, F. B. I.

*Distribution.*—Nepal, Sikhim, Tibet and W. China, only found at very high altitudes.

### PARADOXORNIS, Gould, 1836.

Characteristics: a short rounded wing, the first four primaries graduated, the fifth and sixth equal and longest; tail slightly longer than the wing and greatly graduated; legs and feet very strong, the hind claw also stout and long; nostrils completely hidden by feathers; rictal bristles well developed; bill short, stout, greatly curved, deeper at the base than length from gape. The lower edge of upper mandible greatly curved downwards at the base (parrot-like); the eggs of this genus are spotted.

*Paradoxornis* have wonderful curved edges to their bills, evidently intended for cutting purposes, and remind one rather of "Garden" or "rose" scissors, in which the two blades are curved to fit each other.

### * PARADOXORNIS FLAVIROSTRIS, Gould.

*Gould's Parrot-billed Babbler.*

Gould, P. Z. S., 1836, p. 17; Sharpe, Cat. B. M., vii., p. 496; Oates, F. B. I., i., p. 62; Baker, J. B. N. H. S. viii., p. 167.

Description as in F. B. I.

*Distribution.*—Terai of E. Himalayas, Nepal to Assam, Sylhet, Cachar and Khasia Hills.

*Nesting.*—See Ibis, Jan. 1895, p. 42.

### PARADOXORNIS GUTTATICOLLIS, David.

*Austen's Parrot-billed Babbler.*

David, N. Arch. Mus., vii., Bull. p. 14. (1871); Sharpe, Cat. B. M., vii., p. 497; Oates, F. B. I., i., p. 63; Baker, Ibis 1906, p. 87, J. B. N. H. S., xiii, p. 400; Harington, J. B. N. H. S., xiv, p. 596.

Description as in Oates, F. B. I.

*Distribution.*—Assam, Khasia and Naga Hills, Bhamo and Shan States, W. and S. China.

"The nests are deep cups, measuring about 3½ inches in depth and the same in diameter. They are very typical of the sub-family, being made almost entirely of the bright yellow bark of a kind of grass, lined with yellowish strips of grasses and bamboo leaves, so that, as a whole, they appear bright yellow. The nests are placed from 3 to 4 feet above the ground in a clump of bamboos, straggling shrub or a tall stout weed. The eggs two or three in number. The shell is extremely fragile, and have the ground colour, a whitish to greenish-grey, with faint blotches and spots of brownish, and measure ·93″ × ·63″" (Baker).

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* PARADOXORNIS HEUDII, David, 1873.

Sharpe, Cat. B. M., vii., p. 497.
*Hab.*—Nankin, China.

### SUTHORA, Hodgson, 1838.

Oates, F. B. I., i., p. 63; Jerdon, B. I., ii, p. 6.

I have followed Mr. Oates, for the present, in keeping the following together, *Heteromorpha*, *Chleuasicus* and *Suthora*, but consider they should be separated, and that this genus should only contain birds of the type of *S. nepalensis*, Hodgson, and *S. poliotis*, Blyth. All the *Paradoxornithidæ*, with the exception of *Conostoma* grade into each other, having almost the same structural characteristics, but fall into groups from their size, and description and colour plumage. I think, therefore, it a mistake keeping two birds, such as *S. unicolor* (Hodgson) and *S. poliotis* (Blyth) in the same genus.

The above three genera all have the following characteristics: tail longer than the wing, and greatly graduated: wing short and rounded, the first four primaries graduated; a short deep bill; nostrils completely hidden by feathers; rictal bristles well developed, no hairs overhanging the nostrils; legs and feet very strong, with the hind claws stout and long. Each genus having the following characteristics of its own.

*Heteromorpha*, type *H. unicolor*, Hodgson.—Size medium, wing over 3 inches; bill short, deep, about equal in depth at the base to its length from the gape; plumage plain and practically of the same colour. Nothing appears to be known about the nidification of this species. I think in this genera might be included those Suthora of the *S. webbiana* and *S. w. brunnea*, Anderson type; the eggs of these being a pale spotless blue.

*Suthora*, type *S. nepalensis*, Hodgson.—Size very small, wing well under 2 inches; bill very short and curved, longer from the gape than deep at the base; plumage very handsome, generally a patch of black on the throat, and upper plumage a rich golden brown. All the members of this proposed genera, whose nidification is known, lay spotless blue eggs like those of the *S. w. brunnea* in the *S. webbiana* group.

*Chleuasicus*, type *C. ruficeps*, Blyth.—Very like *Suthora*, differing in size, wing well over 2 inches; bill equal in depth at the base to length from gape; colour rufous brown, with no conspicuous spot on the chin or throat. Eggs as far as known a spotless blue.

### KEY, S. POLIOTIS and NEPALENSIS.

I.—A well defined black supercilium—
    *A.*—Crown and whole upper plumage orange brown.
        *a.* Ear-coverts slaty-grey.
            $a^1$. Breast and abdomen pale-grey .. .. *S. p. poliotis.*
            $b^1$. „ „ „ orange-fulvous .. *S. p. ripponi.*
            $c^1$. „ grey „ „ „ .. .. *Sub-sp. ?.**
        *b.* Ear-coverts light chestnut. (Breast white, abdomen orange-fulvous) .. .. .. *S. p. humei.*
    *B.*—Crown ashy-brown, remainder of upper plumage orange-brown. (Ear-coverts pale-grey, lower plumage orange-fulvous.) .. .. .. *S. nepalensis.*
II.—No supercilium—
    *C.*—Crown and whole upper plumage orange-brown.
        *c.* Ear-coverts brown.
            $d^1$. Breast white, abdomen orange-fulvous .. *S. v. verreauxi*
            $e^1$. „ ashy, „ „ „ .. .. *S. v. craddocki.*
        *d.* Ear-coverts slaty-grey. (Breast and abdomen fulvous ?) .. .. .. .. .. *S. p. feæ.*
    *D.*—Crown pale-orange, remainder of upper plumage golden-olive .. .. .. .. .. *S. morrisoniana.*

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* (An undescribed sub-species procured by Mr. C. Hopwood in the Northern Chin Hills.)

### SUTHORA UNICOLOR, Hodgson.

*The brown Parrot-billed Babbler.*

*Heteromorpha unicolor*, Hodgson, J. A. S .B., xii, p. 448 (1848).
*Suthora unicolor*, Sharpe, Cat. B. M. vii, p. 493; Oates, F. B. I., i, p. 64.

Description as in Oates, F. B. I.

*Distribution.*—E. Himalayas, Nepal, Tibet and W. China. Nothing appears to be known about its nidification.

### SUTHORA NEPALENSIS, Hodgson.

*The Nepal Suthora.*

Hodgson, Ind. Rev., ii. p. 32 (1838); Sharpe, Cat. B. M., vii, p. 488; Oates, F. B. I., i., p. 65.

Description as in Oates, F. B. I.

*Distribution.*—Nepal. I can find nothing recorded about its nesting.

### SUTHORA POLIOTIS POLIOTIS, Blyth.

*Blyth's Suthora.*

Blyth, J. A. S. B., xx, p. 552 (1851); Sharpe, Cat. B. M., vii, p. 487; Oates, F. B. I., i, p. 65.

Description as in Oates, F. B. I.

*Distribution.*—Khasia, Naga, and Kachin Hills, Bhamo District, Burma.

I procured this little bird at Sinlum in the Bhamo Hills, but failed to get its nests. I only met with it in fairly high tree jungle, and shot it in company with *Ægithaliscus talifuensis*, Rippon. It appears to have much the habits of a tit.

Iris brown; bill black; legs and feet brown (Sinlum birds).

Its nest has often been taken, but I cannot find anything recorded. I have a pair of eggs kindly given me by Mr. Stuart Baker; these are a very pale-blue and quite spotless, and in size slightly smaller than the eggs of *S. w. brunnea*, Anderson's Suthora.

### SUTHORA POLIOTIS HUMEI, Sharpe.

*The Sikhim Suthora.*

Sharpe, Cat. B. M., vii, p. 489 (1883); Oates, F. B. I., i, p. 64.

Description as in Oates, F. B. I.

I think the name "Crow-tit" invented by Mr. Oates rather a misnomer for these beautiful little birds; and suggest that, failing any other the name "Suthora" be adopted for them, all these nearly allied sub-species are "black-fronted," this name is therefore not distinctive.

*Distribution.*—Sikhim and Darjeeling. I can find no records of its nidification.

### SUTHORA POLIOTIS FEÆ, Salvadori.

Salvadori, An. Mus. Civic. Genov. (2), vii, p. 364 (1889); Oates, F. B. I., i, p. 66 (footnote).

Description as in Oates, F. B. I.

(I have not been able to examine a specimen of this species.)

*Distribution.*—Karennee. This appears to be a very rare sub-species.

### SUTHORA POLIOTIS RIPPONI, Sharpe.

*Rippon's Suthora.*

Sharpe, Bul. B. O. C., xv, p. 96 (1905).

*Description.*—Very similar to *S. p. poliotis*, Blyth, from the Naga Hills. Differs in having abdomen bright orange-fulvous instead of grey; and ear-coverts pale-grey.

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Length about 4·4″, wing 1·9″, tail 2·25″, tarsus ·75″.
*Distribution.*—Mt. Victoria, Chin Hills.

### SUTHORA VERREAUXI CRADDOCKI, Bingham.

Bingham, Bull, B. O. C., xiii, p. 55 (1903).
*Description*:—"Forehead, crown, nape, back, rump and upper tail-coverts orange-brown, shaded on the nape and back with olive-brown; the primaries edged externally with white, the secondaries and tertiaries broadly edged with bright orange-brown; the primary coverts brown, forming a conspicuous patch on the upper portion of the wing; tail brown, the outer webs of the feathers bright orange-brown for three-fourths of their length from the base; lores, cheeks, and a long supercilium white, the white of the cheeks extending on to the sides of the neck; ear-coverts brown; chin and throat black, shading into gray on the upper breast; abdomen and undertail coverts bright orange-brown." (Bingham).

Upper mandible horny, lower fleshy yellow, legs and feet fleshy-brown. Length about 4″, wing 1·8″, tail 1·9″, bill 0·3″, tarsus 0·9″.

*Hab.*—Mekong watershed, Keng Tung State.

*Note.*—Resembles *S. v. verreauxi*,* but abdomen and under-tail coverts bright orange-brown, not white.

### SUTHORA WEBBIANA BRUNNEA, Anderson.

*Anderson's Suthora.*

*S. brunnea.* Anderson, P. Z. S., 1871, p, 211; Oates, F. B. I., p. 68,† Harington, J. B. N. H. S., xvi. p. 740; *ibid*, xix, p. 111, *id.*, Ibis, 1914, p. 6.

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* SUTHORA MORIZONIANA, O. Grant.
O. Grant, Bull. B. O. C., xvi, p. 116 (1906); Ibis, 1907, p. 188.
*Hab.*—Mt. Morrison. Formosa.
SUTHORA VERREAUXI VERREAUXI, Sharpe.
Sharpe, Cat. B. M., vii, p. 488, (1883.)
*Distribution.*—West Szechuen and Moupin, China.

† *Suthora webbiana.*—There are numerous geographical races of this species from China and Mongolia, and many are very hard to distinguish.
SUTHORA WEBBIANA WEBBIANA, Gray.
Gray, P. Z. S., 1852, p. 7870; Sharpe, Cat. B. M., vii, p. 490.
*Hab.*—N. China.
SUTHORA WEBBIANA STYANI, Rippon.
Rippon, Bull, B. O. C., xiii, p. 54, 1903.
*Hab.*—W. Yunnan.
SUTHORA WEBBIANA SUFFUSA, Swinhoe.
Swinhoe, P. Z. S., 1871, p. 300.
*Hab.*—Upper Yangtze, China.
SUTHORA CONSPICILLATA, David.
David, N. Arch. Mus., vi, Bull., p. 14, 1870; Sharpe, Cat. B. M., vii, p. 489.
*Hab.*—N. W. China.
SUTHORA PRZEWALSKII, Berez and Bianchi.
Berez. and Bianchi, Exped. Potan. Gansu, p. 67, 1894.
*Hab.*—Kansu.
SUTHORA ALPHONSIANA, Verreaux.
Verreaux, N. Arch. Mus., vi, Bull., p. 35, 1870; Sharpe, Cat. B. M., vii, p. 489.
*Hab.*—Yunnan, Szechuen.
SUTHORA BULOMACHUS, Swinhoe.
Swinhoe, Ibis 1863, p. 300; Sharpe, Cat. B. M., vii, p. 490.
*Hab.*—Formosa.
SUTHORA MANTSCHURICA, Tacz.
Tacz., Bull. Soc. Zool. Faun., 1885, p. 470.
*Hab.*—Mongolia and Corea.
*S. fulvicauda and S. longicauda*, Campbell, are probably the young of this species.

Description as in Oates, F. B. I.

*Distribution.*—Yunnan and the Kachin Hills, East of Bhamo.

I found it a very common little bird at Sinlum in the Bhamo Hills. During the cold weather it goes about in large family parties, haunting bushes and trees; in the breeding season it retires to long grass and rushes where it builds its nest. This is a compact little cup, which is placed near the ground. The eggs, generally three in number, are pale, spotless blue and measure ·64 × ·52 inches.

### SUTHORA FULVIFRONS, Hodgson.

*The fulvous-fronted Parrot-billed Babbler.*

*Suthora fulvifrons*, Hodgson, J.A.S.B., xiv, p.579 (1845); Oates, F.B.I.,i, p. 66.

*Chleuasicus fulvifrons*, Sharpe, Cat. B. M., vii, p. 494.

Description as in Oates, F. B. I.

*Distribution.*—Nepal and Sikhim. Nothing appears to be known of this species, which is quite distinct from the *S. poliotis* group.

### SUTHORA RUFICEPS RUFICEPS, Blyth.

*Blyth's Parrot-billed Babbler.*

*Chleuasicus ruficeps*, Blyth, J. A. S. B., xiv, p. 578 (1845); Sharpe, Cat. B. M., vii., p. 494.

*Suthora ruficeps*, Oates, F. B. I., i, p. 67.

*Suthora oatesi*, Sharpe, "Hand List" iv, p. 70, 1903.

Description as in Oates, F. B. I.

"This bird is almost an exact counterpart of *P. rufieeps ruficeps* differing from it chiefly in its blunter bill and more graduated tail."

Dr. Sharpe proposes the name of *oatesi*, for this species to save confusion with its very near ally, *P. r. ruficeps*; both are extremely alike and the similarity of names is very liable to cause mistakes, and therefore I think it should be adopted.

*Distribution.*—Sikhim.

### SUTHORA RUFICEPS ATRISUPERCILIARIS, Godwin-Austen.

*Austen's Parrot-billed Babbler.*

*Chleuasicus atrisuperciliaris*, Godw. Aust., P. A. S. B., 1877, p. 147.

*Suthora atrisuperciliaris*, Oates, F. B. I., i., p. 67; Baker, J. A. S. B., viii, p. 167; *id.*, Ibis, 1895, p. 45.

Description as in Oates, F. B. I.

I have only been able to examine two very poor specimens of this subspecies, which appear to be very similar to *S. r. ruficeps*.

Dr. Hartert in a letter says: "I have restricted *ruficeps* to Sikhim, after examining *one* specimen only, and I have made *atrosuperciliaris* to occur in Cachar, Margherita, Sadiya, Ponsee (Yunnan Frontier) accepting that it differs from *S. ruficeps ruficeps*, by a small black spot above the eye, and quite rufescent cream under plumage.

Wing 70-74 mm. We have specimens from N. Cachar, Dibrugarh and Margherita (Assam).

Stuart Baker has taken the eggs of this bird, and he describes them as pale spotless blue.

Nesting: *see* Ibis, 1895, January, p. 45.

### PSITTIPARUS, Hellmayr, 1903.

The generic name *Scæorhynchus*, Oates is preoccupied, therefore the above most appropriate one has been given.

This genus differs from *Paradoxornis* in the shape of its bill, and in having its wing longer than its tail, and has the following characteristics. Tail shorter than wing, and not greatly graduated; wing short, rounded the first four primaries graduated, the fifth longest; legs and feet stout and strong; nostrils completely hidden by feathers, rictal bristles well developed; no hair overhanging nostrils; bill from gape longer than it is deep at the base.

### Psittiparus ruficeps ruficeps, Blyth.

*The Red-headed Parrot-billed Babbler.*

*Paradoxornis ruficeps*, Blyth, J. A. S. B., xi, p. 177 (1842).
*Suthora ruficeps*, Sharpe, Cat. B. M., vii, p. 491.
*Scæorhynchus ruficeps*, Oates, F.B.I., i, p. 68; Hartert, Nov. Zool. i, p. 548.
Description as in Oates, F. B. I.

"Bill smaller, wing a little shorter, under-surface white tinged with brownish-buff along the sides of the body. Bill whitish horny (Elwes). Bill from forehead to tip in a straight line, 14 m.m., wing 84-86 m.m." (Hartert).

*Distribution.*—Sikhim and Butan, Dafla and Mishmi Hills, extending into the foot hills to Sadiya and Jeypur.

### Psittiparus ruficeps bakeri, Hartert.

*Baker's Parrot-billed Babbler.*

*Scæorhynchus r. bakeri*, Hartert, Nov. Zool., vii, p. 545 (1900.)

*Description.*—Similar to *P. r. ruficeps*, Blyth. Differs in "bill longer, wing a little longer, under-surface tinged with brownish-buff all over. Maxilla of bill dark horn-brown (Baker). Bill from forehead to tip in a straight line, 16 m.m.; wing 90-95 m.m."

"The bill is not only longer, but is also higher and much thicker; its colour is darker in the skins. And the notes of the collectors on our labels agree as to this." (Hartert).

*Distribution.*—South of the Bramhaputra River, Assam, Cachar, Karennee and Tenasserim. Most probably also in the Chin and Bhamo Hills.

### Psittiparus gularis gularis, Horsfield.

*The grey-headed Parrot-billed Babbler.*

*Paradoxornis gularis*, Horsf. Gray's Gen. B. ii. p. 389. (1849).
*Suthora gularis*, Sharpe, Cat. B. M., vii, 492.
*Scæorhynchus gularis*, Oates, F. B. I., i, p. 69.
*S. gularis gularis*, Hartert, Nov. Zool., vii, p. 548.
Description as in Oates, F. B. I.

"Of medium size, under-plumage white; bill about 12-13 m.m.; wing 91-93 m.m." (Hartert).

*Distribution.*—Sikhim and Butan, the Mountain Ranges N. of the Brahmaputra as far as Sadiya.

### * Psittiparus gularis transfluvialis, Hartert.

*Hartert's Parrot-billed Babbler.*

*Scæorhynchus gularis transfluvialis*, Hartert, Nov. Zool., vii, p. 548 (1900).

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* P. gularis forkiensis, David.
Hartert, Nov. Zool., vii, p. 548.
*Distribution.*—Fokien, China.

Psittiparus gularis, hainanus, Rothschild.
Rothschild, Bull B. O. C., civ, p. 7. (1903).
Wing 84-87 m,m.
*Hab.*—Mt. Wuchi, Hainan.

*Description.*—Similar to *P. g. gularis* (Blyth). Differs in being "smaller; bill less powerful; under plumage more suffused with fulvous buff. Bill of the same length as that of *P. g. gularis*, but not so thick. Wing 86-89 m.m."

*Distribution.*—South of the Brahmaputra, Assam, Cachar, Khasia Hills, the Shan States and Karennee, and probably the intervening country.

### † NEOSUTHORA, n. gen.

I propose the above generic name with *N. d. davidiana* (Slater) as type.

Differs from *Suthora* in having an extremely short tail, which is much shorter than wing: also a much thicker bill, which is as deep at the base as it is long from the gape. It is very similar to *Psittiparus* in structural characteristics, and differs chiefly in size. It will be most interesting to know what the eggs of this genus are like, whether they are spotless as in *Suthora*, or spotted as in *Psittiparus*.

### NEOSUTHORA DAVIDIANA THOMPSONI, Bingham.

*Bingham's Parrot-billed Babbler.*

*Suthora thompsoni*, Bingham, Bull. B. O. C., xiii, p. 63, 1903.

*Description.*—Resembles *N. d. davidiana*, Slater, from Foh-kien; but is distinctly smaller and differs in the points noted below: Forehead, crown, sides of the head and nape chestnut, of a much deeper colour than in *N. d. davidiana*, and not extending to the upper back; along the posterior margin of the nape the chestnut colour gets somewhat paler; back, rump and wing coverts clear, rather dark, ash-grey; wings brown, the quill feathers secondaries and tertiaries with the outer margins narrowly light chestnut; upper tail-coverts and the outer web of the tail feathers above chestnut, of a lighter shade than the colour of the head; inner web of the tail feathers brown; chin and throat uniform deep-black, entirely without the white spots so conspicuous in *N. d. davidiana*; upper breast albescent, remainder of the breast and flanks grey like the back; abdomen, lower tail-coverts and tail beneath pale-ochraceous; bill (in the skin) yellow, (in the flesh) "fleshy pink"; irides reddish brown: legs and feet "fleshy yellow" ( Craddock ).

Length: Female, 3·7—3·8 inches; wing 2·1; tail 1·45; bill from gape 0·3; tarsus ·65.

*Hab.*—"Shot north-east of Kyatpyin village near the Paunglaung stream in Loilong State at 2,500 feet on 18th March 1902" (Craddock).

### Family—CRATEROPODIDÆ.

Oates, F. B. I., i., p. 71.

The *Crateropodidæ*, consist of two well marked Sub-Families. (1) *Crateropodinæ*. (2) *Pomatorhinæ* (the Laughing Thrushes and Babblers, and the Scimitar-Babblers.)

I have raised this section of the *Timeliides* to Family rank, it consists of two very distinct Sub-families, which are quite distinct in their characteristics, although they appear to grade from one into the other, through *Babax waddelli*, Dresser.

"The *Crateropodinæ* agree in being gregarious, extremely noisy, cautious but inquisitive and frequently bold. No birds can hide themselves better, but on the whole they do not shun observation as the *Timeliidæ*."—(Oates).

They are chiefly noticeable for their extremely large legs and feet; their small rounded wings; they are non-migratory and partly arboreal and partly territorial in their habits.

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† NEOSUTHORA DAVIDIANA DAVIDIANA, Slater.
*Suthora davidiana*, Slater; Ibis. 1897, p. 172.
*Hab.*—N. W. Foh-kien, China.

The eggs of the *Crateropidinæ* form a very useful guide to their classification. Mr. Oates draws particular attention to this fact, and considered those laying spotted eggs might eventually have to be transferred either to the *Timeliinæ* or *Sibiinæ*. Since Mr. Oates wrote his valuable work, the nidification of the great majority of the Indian *Trochalopeterum* have become known. Those laying spotted eggs fall into a very natural group, which I think should be raised to the dignity of a genus. The colour of the eggs of the remainder is uniformly a spotless blue or white. The texture, however, appears to vary in different genera.

The *Crateropodinæ* fall into the following well marked groups, (1) The Laughing Thrushes, (2) Babblers (*Crateropus* and *Argya*), (3) *Babax*, (4) *Acanthoptila*, (5) *Garrulax cincereifrons*, Blyth, a form peculiar to the island of Ceylon, which appears to be the connecting link between the Laughing Thrushes and Babblers (*Garrulax* and *Crateropus*) whilst *Acanthopila* appears to connect *Argya* with *Babax*. So that we find these five groups, although having well marked features of their own, grading from one into the other. This grading of genera is one of the chief difficulties in the study of the *Timeliides*, and it is often very hard to say whether each group should be treated as one big genus, or sub-divided up into several.

I have, therefore, with the exception of the *Trochalopterum*, kept to Mr. Oates' classification. I wish however to draw attention to differences which exist in the following genera.

*Garrulax.*—I think that *G. leucolophus* and its geographical races should be separated from the other members of this genus, on account of their very ample crests.

*Dryonastes.*—These clearly fall into two groups, those having the bristles and hairs overhanging the nostrils more or less even, and with a delicately curved bill; and those having the bristles growing in coarse tufts, and having a stout straight bill.

*Trochalopterum.*—I have divided up this genus into two, a further subdivision, I think, should be made, separating the four Southern Indian birds from the rest, on account of their plain plumage, all the others having very highly coloured wings and upper plumage.

*Argya longirostis.*—I think this species should be placed in a genus by itself. It undoubtedly is very near *Argya*, but it has a much finer and longer bill than the other members of this group; its eggs also, although being blue, are not the rich turquoise blue of *Argya* and *Crateropus*.

### Group 1.

### LAUGHING THRUSHES.

Have the following characteristics, bill shorter than the head, and not strikingly curved, tail generally longer than the wing, and greatly graduated: the feathers of the forehead with shafts lengthened; and the nostrils more or less overhung with bristles or long hairs.

The Laughing Thrushes as a whole are a well marked group consisting of several distinct genera; whether these should be further subdivided it is very hard to say.

### Group 2.

### CRATEROPUS AND ARGYA. (Babblers.)

Bill shorter than the head, stout and not greatly curved. The posterior half of the covering membrane of nostril clothed with plumes, which are continued back to the forehead, the feathers of which are short and rounded and no hairs overhanging the nostrils, plumage dull and either plain or striated.

### Group 3.

### BABAX.

Bill slightly curved, not notched, and equal to or longer than the hind-toe and claw in length: tail longer than the wing, and considerably graduated; wing rounded, the first four primaries graduated, the fifth longest, sixth equal to the fourth: rictal bristles very pronounced; nostrils oval, exposed, and overhung with numerous hairs: size medium; upper plumage streaked, eggs spotless blue, and approaching *Argya* in coloration.

### Group 4.

### ACANTHOPTILA.

"Bill moderately long, compressed, very gently curved, pointed, entire; rectal bristles few and small, wing feeble, much rounded; tail long and broad; tarsus moderately long, stout, lateral toes nearly equal; claws moderately curved; plumage with black and shining shafts."—(Jerdon B. I., ii., p. 57.)

### Group 5.

### GARRULAX CINEREIFRONS (Blyth.).

This bird is peculiar to Ceylon and I think should be placed in a genus by itself. Oates places it amongst the *Crateropus*, whilst other writers refer it to the Laughing Thrushes (*Garrulax*). It is certainly much nearer the latter in the description of its plumage. Oates points out that his reasons for placing it amongst the Babblers, is that the feathers of its forehead are rounded and approach *Crateropus* in which he placed it. Its eggs, I believe, have not yet been authenticated, but Mr. Stuart Baker informs me that they are possibly white; if this is the case, it is at once sufficient to remove it from amongst the Babblers, whose eggs are uniformly a rich verditer-blue.

### KEY.

- *A.*—Bill straight, or not strikingly curved, and less than hind-toe and claw in length.
  - *a.* Covering membrane of nostrils bare: frontal feathers with shafts or webs lengthened.
    - $a^1$. Nostrils nearly hidden by a profusion of bristles and hairs springing from the forehead .. .. .. .. .. *Dryonastes.*
    - $b^1$. Nostrils clearly visible but overhung with numerous bristles .. .. .. *Garrulax.*
    - $c^1$. Nostrils not overhung with bristles, but merely by a few long and fine hairs.
      - $a^2$. The feathers of upper plumage not stiff shafted.
        - $a^3$. Secondaries tipped white .. *Ianthocincla.*
        - $b^3$. Secondaries not tipped white.
          - $a^4$. Bill slender, upper plumage plain .. .. *Stactocichla.*
          - $b^4$. Bill stout, upper plumage striated .. .. .. *Grammatoptila.*
      - $b^2$. The feathers of upper plumage stiff shafted.. .. .. .. *Acanthoptila.*
    - $d^1$. Nostrils perfectly free and exposed, and not overhung with hairs or bristles. *Trochalopterum.*

*b*. Covering membrane of nostril bare, frontal feathers short and rounded .. .. .. *Garrulax cinereifrons.*

*c*. Posterior half of covering membrane of the nostrils clothed with plumelets continued back to the forehead, the feathers of which are short and rounded.

$e^1$. Tail very much longer than the wing... *Argya.*

$f^1$. Wing and tail almost equal in length.. *Crateropus.*

*B.*—Bill curved, equal to or slightly longer than hind-toe and claw (upper plumage streaked) .. *Babax.*

## Group 1. *Laughing Thrushes.*

### DRYONASTES (Sharpe) 1883.

Oates, F. B. I. i., p. 72.

"The genus *Dryonastes* of which *D. ruficollis* (Jardine) is the type contains those Laughing Thrushes which have the nostrils almost completely hidden by bristles. They are very closely allied to some of the *Corvidæ* in structure and they might almost be placed in the same family. They differ, however, in laying spotless eggs and in their habits."—(Oates.)

They have the following characteristics, a rounded wing; tail and wing almost equal; nostrils pierced and almost hidden by overhanging hairs and bristles.

All lay spotless eggs, pale blue or white.

Key, as in Oates F. B. I.

*Dryonastes* fall into two sub-groups, chiefly noticeable for the amount of bristles.

### I. *Sub-Group*—Type D. RUFICOLLIS (Jardine).

Having the feathers at the base of the forehead and bill a stiff mass of bristles; the bill small, narrow and gently curved; the wing with the first four primaries graduated and the 5th and 6th equal and longest. This sub-group consists of the following Indian species.

*D. ruficollis, D. sannio,* and *D. galbanus,* the bristles at the base of the bill of this last species form almost a smooth velvety mass.

### II. *Sub-group.*—Type D. C. CÆRULATUS (Hodgson).

The feathers at the base of the forehead and at the base of the bill growing in irregular tufts; the bill rather long, stout and almost straight, and the first five primaries graduated. This sub-group consists of the following Indian species *D. cærulatus, D. chinensis* and *D. nuchalis.*

The numbers of both sub-groups lay spotless blue or white eggs, the texture of which in each group is quite distinct. In the first highly glossy and close. In the second satiny and not very glossy.

### DRYONASTES RUFICOLLIS (Jardine).

*The Rufous-necked Laughing Thrush.*

*Ianthocincla ruficollis,* Jard. and Selby, Ill. Orn. 2nd series, pl. 21. (1838).

*Dryonastes rufiocollis,* Sharpe, Cat. B. M. VII, p. 454; Oates, F. B. I., i., p. 73.

*Description* as in Oates, F. B. I.

*Distribution.*—Only found at low elevations in the Himalayas from Nepal to Assam, Manipur and Northern Burma, in the Upper Chindwin, Myitkyina and Bhamo Districts in the plains.

### DRYONASTES SANNIO (Swinhoe).

*The White-browed Laughing Thrush.*

*Garrulax sannio*, Swinhoe, Ibis. 1867, p. 403.
*Dryonastes sannio*, Sharpe, Cat. B. M. VII, p. 459 ; Oates, F. B. I. i., p. 76.
*Description* as in Oates, F. B. I.

*Distribution.*—Manipur, the hills on the eastern borders of Burma, where it is the common Laughing Thrush, above 3,500 ft., and from the Bhamo Hills to the Shan States and extending to S. China. Its eggs have often now been described and are remarkable for their variation in colour from pale blue to white.

### DRYONASTES GALBANUS (Godwin-Austin).

*Austen's Laughing Thrush.*

*Garrulax galbanus*, Godn-Aust., P. Z. S., 1874, p. 44 ; Sharpe, Cat. B. M. VII, p. 445.
*Dryonastes galbanus*, Oates, F. B. I. i, p. 76.
*Description*, etc., as in Oates, F. B. I.
*Distribution.*—The Manipur and Chin Hills.

[The nest and eggs have recently been taken by Mr. C. Hopwood in the Chin Hills. He describes both as being similar to those of *D. ruficollis* and in a letter to me he gives the dimensions as being 1·06″ × ·76″.

With the exception of a single nest taken by myself in N. Cachar many years ago, this is I believe the first recorded nest and eggs of this species. My eggs are practically indistinguishable from those of *ruficollis* though they measure somewhat over the average of this bird's eggs.—E. C. S. B.]

### DRYONASTES CÆRULATUS.

*The Grey-sided Laughing Thrush.*

Consists of three geographical races which extend from Nepal to Assam north of the Brahmaputra river (*D. c. cærulatus* (Hodgson). The Khasia Hills have their own race in *D. c. subcærulatus* (Hume), which possibly may extend to the Chin Hills. This sub-species differs from the first in having its tail feathers tipped with white. In the Bhamo hills, *D. c. kauriensis* (Rippon), is the local representative, this has the tail tipped with white, and the ear-coverts brown instead of white.

### DRYONASTES C. CÆRULATUS (Hodgson).

*The Nepal Grey-sided Laughing Thrush.*

*Cinclosoma cærulatus*, Hodgson, As. Res. XIX, p. 147, (1836).
*Dryonastes cærulatus*, Sharpe, Cat. B. M. VII., p. 461 ; Oates, F. B. I., i., p. 75.
*Description*, etc., as in Oates, F. B. I.
*Distribution.*—Nepal and Sikhim, Dibrugarh, Assam.

### DRYONASTES CÆRULATUS SUBCÆRULATUS (Hume).

*The Shillong Laughing Thrush.*

*Garrulax subcœrulatus*, Hume, S. F. VII., p. 140 (1878).
*Dryonastes subcærulatus*, Sharpe, Cat. B. M. VII, p. 462 ; Oates, F. B. I., i., p. 76.
*Description* as in Oates, F. B. I.

*Distribution.*—Confined to the Khasia Hills.

[The nest is similar to that of *D. ruficollis*, but is a larger, more bulky nest and is generally deeper also in proportion to its breadth. It is composed of small pliant twigs and weed stems, leaves, grasses, rootlets and sometimes a few leaves. The lining is of fine grasses and roots generally almost black in tint. The most common site is a thin straggling bush in which it is placed in some fork three to six feet from the ground but often it is placed in tangles of brambles, blackberries, or raspberries within a foot or so of the ground. On one or two occasions it has been taken from small saplings as high up as 12 feet.

The eggs are generally two only in number, very rarely three and still more rarely four, and are in general character about half way between the eggs of the genus *Garrulax* (*moniliger*, etc.,) and the intensely glossy ones of the typical *Dryonastes* such as *sannio*. The surface is very smooth and glossy, but is not so hard and shiny as that of the last mentioned bird, the texture is very fine and close and the shell rather fragile. In colour they are a pale but brilliant green-blue and when freshly taken are most distinctive in tint, but after a year or two are hardly distinguishable from pale, highly glossed eggs of other birds of this group, though darker than any but those of *cærulatus*.

In length they very likewise 1·24″ and 1·39″ and in breadth between ·79″ and ·86″, the average of 14 being 1·32″ × ·82″—E. C. S. B.]

### DRYONASTES CÆRULATUS KAURIENSIS, Rippon.

*The Kachin Hills Laughing Thrush.*

Rippon, B. B. O. C. XII., p. 13. (1902); Harington, B. N. H. S. J. XIX., p. III. *id. Ibis.* 1914, p. 7.

*Description.*—Similar to *D. c. subcærulatus*, Hume, differs in having the ear-coverts rufescent-brown, instead of white. The tail is tipped with white as in that species.

*Distribution.*—The Bhamo Hills above 5,000 feet.

*Nesting.*—The nest is of the usual type, the eggs pale blue, measuring 1·16 × ·84 inches.

### DRYONASTES CHINENSIS (Scop.).

*The Black-throated Laughing Thrush.*

*Lanius chinensis*, Scop, Del. Fl. et Faun. Insubr, ii, p. 86 (1786).

*Dryonastes chinensis*, Sharpe, Cat. B. M. VII, p. 455; Oates, F. B. I., i, p. 74; Harington, J. B. N. H. S., XIV., p. 597.

*Description* as in Oates, F. B. I.

*Distribution.*—The Southern Shan States and Karennee to Tenasserim and S. Pegu, and extending into China. It has lately been procured in the Northern Shan States by Mr. J. P. Cook.

I described the eggs of this species in the Journal, Vol. XIV, p. 597, but as I did not obtain the parent bird, I am afraid I am not quite certain as to their identification. Although such a well-known species as a cage bird, I can find nothing else recorded as to its nidification.

### DRYONASTES NUCHALIS (Godwin-Austen).

*Ogle's Laughing Thrush.*

*Garrulax nuchalis*, God.-Aust. A. M. N. H. (4) XVIII, p. 411, (1876).

*Dryonastes nuchalis*, Sharpe, Cat. B. M. VII, p. 456; Oates, F.B.I., i, p.74; Baker, *Ibis* 1906, p. 89.

*Description* as in Oates, F.B.I.

*Distribution and nidification*—

For Breeding notes see "Ibis" Jan. 1906, p. 89.

*Note.*—This is the same type of bird as *D. chinensis,* only differing from it in having a chestnut collar, and is most likely only a geographical race of that species. I should not be surprised if a connecting link was found in the Chin Hills.

### GARRULAX, Lesson.

Type—*G. belangeri*, Lesson.

Oates, F. B. I. i., p. 77.

"The genus *Garrulax* differs from *Dryonastes* in having fewer bristles and hairs covering the nostrils, the number being so reduced that the nostrils are clearly visible. The species of *Garrulax* are on the whole much larger birds, and some of them have very ample crests"—(Oates).

This genus falls into two natural groups and I think should be subdivided : (I) *Those having a large ample crest* as *G. leucolophus, belangeri,* and *diardi* which are only geographical races of the first species, and (II) *The remainder which have no real crest.* Both groups have the following characteristics. The usual round wing, with the first four primaries graduated; wing and tail about equal in length, nostrils oval, exposed and overhung by a few hairs. The first group lay white eggs, the second both white and blue.

[The texture of the eggs of the two groups is absolutely different, that of the egg of the crested *leucolophus* group is intensely hard and glossy, the surface pitted and the shell unusually stout. That of the *moniliger* group have the surface fine and smooth, not so highly glossed and never pitted, and the shell is not nearly so stout. In shape also they differ, the eggs of the former group being very round and blunt, whilst those of the latter are generally long and pointed. *Garrulax delesserti* appears to be a connecting link between the two genus.—E. C. S. B.]

### GARRULAX LEUCOLOPHUS LEUCOLOPHUS (Hardwick).

*The Himalayan White-crested Laughing Thrush.*

*Corvus leucolophus*, Hardw. Trans. Lim. Soc. XI, p. 208 (1815).

*Garrulax leucolophus,* Sharpe, Cat. B. M. VII, p. 77, p. 435; Oates, F. B. I. i, p. 77.

*Description*, etc., as in Oates, F. B. I.

*Distribution.*—From Garwal in the Himalayas to the extreme east of Assam, the Chin Hills, and Chindwin basin on the west of Burma. Yunnan and the Bhamo Hills, its exact distribution on the east and west of Burma not yet determined, probably restricted to the north of the "Dry-Zone" of Burma.

### GARRULAX LEUCOLOPHUS BELANGERI, Lesson.

*The Burmese White-crested Laughing Thrush.*

Lesson Tr. d'Orn. p. 648 (1831); Sharpe, Cat. B. M. VII., p. 436; Oates, F. B. I., i, p. 79.

*Description* as in Oates, F. B. I.

*Distribution.*—The Hills of Lower Burma and Tenasserim, the Southern Shan States, the exact locality where this species meets the last, both on the eastern and western sides of Burma, has not yet been determined.

It differs from *G. l. leucolophus,* in having its under plumage rufous instead of olive-brown, and is a smaller bird than *G. l. diardi.*

[The nest and eggs, of which I have many, cannot be distinguished from those of *leucolophus.*—E.C.S.B.]

### GARRULAX LEUCOLOPHUS DIARDI (Lesson).*

*The Siamese Laughing Thrush.*

*Turdus diardi,* Less. Tr. d'Orn. p. 408 (1831).

*Garrulax diardi,* Sharpe, Cat. B. M. VII, p. 437 ; Oates, F. B. I.i, p. 79.

*Description* as in Oates, F. B. I.

*Distribution.*—Siam, Cambodia and within Indian limits, cis-Salween Maukmai, S. S. States, and the frontier range between Tenasserim and Siam.

[The nest is exactly like the nest of the two preceding birds, but the eggs average a trifle larger—E. C. S. B.]

### GARRULAX PECTORALIS (Gould).

*The Black-gorgeted Laughing Thrush.*

*Ianthocincla pectoralis,* Gould, P. Z. S. 1835, p. 186.

*Garrulax pectoralis,* Sharpe, Cat. B. M., VII., p. 441 ; Oates, F. B. I. i., p. 80.

*Description* as in Oates, F. B. I.

Mr. Oates draws attention to the variation in the colour of the ear-covert, these may vary from black to almost pure white in birds from the same locality. The only variation that seems to hold good, is that of the Tenasserim birds which have buff-coloured tips to the tail feathers, those from the Himalayas and other localities have the tails tipped with white.

*Distribution.*—From Nepal to Assam, thence through Burma to Tenasserim.

> *Garrulax waddelli,* O. Grant, Bull, B. O. C., III, p. 29 (1894) and Blanford App. Vol. IV, F. B. I., p. 478.†

There is only one specimen of this so-called sub-species from Sikhim, where *G. pectoralis* also occurs, and is in all probability a case of individual variation.

### GARRULAX MONILIGER (Hodgson).

*The Necklaced Laughing Thrush.*

*Cinclosma moniligera,* Hodgson, As. Res. XIX., p. 147 (1836).

*Garrulax moniliger,* Sharpe, Cat. B. M. VII., p. 442 ; Oates, F. B. I. i., p. 81.

*Description* as in Oates, F. B. I.

*Distribution.*—Practically the same as *G. pectoralis.* Both these species are found at low-elevations, and consort together in parties, and although so very alike are quite distinct, and easily separable by size.

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* *Allied sub-species.*

*G. bicolor,* Hartl. From Sumatra.

Very noticeable for its rich almost chocolate colour, it however belongs to this group of the Laughing Thrushes with a noticeable white crest.

† *Allied sub-species* are—

*G. picticollis,* Swinhoe, P. Z. S., 1872, p. 554. From Foh-kien and the Yangtze Valley, China.

*S. semitorquatus,* O. Grant, B. B. O. C., l. c. p. 49, (1900). From Hainan.

### GARRULAX GULARIS (McClelland).

*McClelland's Laughing Thrush.*

*Ianthocincla gularis*, McClell., P. Z. S., 1839, p. 159.

*Garrulax gularis*, Sharpe, Cat. B. M., VII., p. 445; Oates, F.B.I,i.,p. 82; Baker, *Ibis* 1895, p. 46.

*Description* as in Oates, F. B. I.

*Distribution.*—Assam.

*Nesting*—Stuart Baker says that this species breeds during April to July in the hills north-east of Cachar. It appears to build the usual type of nest, and lays two, rarely three, eggs. These are either pure white, or pale blue, intermediate shades rarer, and vary from 1·75 to 1·22 in length, and 0·75 to 0·85 in breadth. Average being 1·15″ × ·80″.

### GARRULAX DELESSERTI (Jerdon).

*The Wynaad Laughing Thrush.*

*Crateropus delesserti*, Jerdon, Madras Journ. L. S. X, p. 356 (1839).

*Garrulax delesserti*, Sharpe, Cat. B. M., VII., p. 446; Oates, F. B. I., i, p. 82; Baker, *Ibis* 1906, p. 90.

*Description* as in Oates, F. B. I.

*Distribution.*—The Hills of S. India.

*Nesting*—See *Ibis* 1906, p. 90.

[The eggs are always white and never blue. I have a very fine series of these eggs which I owe to the generosity of Mr. J. Stuart of Travancore. The nest he describes as a bulky deep cup, sometimes almost semi domed, sometimes hardly bigger or stouter than that of *Molpastes*. The eggs, two or three in number, are pure white miniatures of those of *Garrulax leucolophus*, but are not pitted on the surface or only *very* slightly so, are finer and softer in texture and closer grained. They average about 1·05″ × ·80″. A few eggs may be met with more or less pointed in shape but normally they are broad obtuse ovals—E. C. S. B.]

### GARRULAX ALBIGULARIS (Gould).

*The White-throated Laughing Thrush.*

*Ianthocincla albogularis*, Gould, P. Z. S., 1835, p. 187.

*Garrulax albogularis*, Sharpe, Cat. B. M., VII., p. 439; Oates, F. B. I. i., p. 82.

*Description* as in Oates, F. B. I.

*Distribution.*—North-West Himalayas and Sikhim. As mentioned by Oates, birds from Sikhim and to the North-East are much brighter coloured: also birds from the North-West appear to have a very much shorter and stouter bill, which might be considered sufficient to constitute a well-marked geographical race.

### GARRULAX STREPITANS (Tickell.).

*Tickell's Laughing Thrush.*

Blyth, J. A. S. B., XXIV, p. 268. (1855).

*Dryonastes strepitans*, Sharpe, Cat. B. M., VII., p. 457.

*Garrulax strepitans*, Oates, F. B. I. i., p. 83.

*Description* as in Oates, F. B. I.

*Distribution.*—So far has been only obtained on Muleyit Mt., Tenasserim. Nothing appears to be known of its nidification, or the colour of its eggs.

## IANTHOCINCLA, Gould. 1835.

*Type I. ocellata* (Vigors).

Oates, F. B. I., i., p. 84.

"I apply the generic term *Ianthocincla* to those Laughing Thrushes which have no bristles at the base of the forehead; but in which the nostrils are overhung by a few long hairs. This genus differs in no other respect from *Dryonastes* and *Garrulax*. All the species are remarkable in having the secondaries tipped with white."—(Oates).

*Ianthocincla* have a rather narrow bill; the nostrils oval, and exposed, and overhung with numerous long hairs; the first five primaries are graduated; and the tail slightly longer than the wing.

### * IANTHOCINCLA OCELLATA (Vigors).

*The White-spotted Laughing Thrush.*

*Cinclosoma ocellatum*, Vigors, P. Z. S., 1831, p. 55.
*Ianthocincla ocellata*, Sharpe, Cat. B. M., VII, p. 382; Oates, F. B. I., i., p. 84.
*Description* as in Oates, F. B. I.
*Distribution.*—Nepal and Sikhim.

### IANTHOCINCLA CINERACEA (Godwin-Austen.)†

*The Ashy Laughing Thrush.*

*Trochalopterum cineraceum*, Godwin-Austen, P. Z. S., 1874, p. 45; Sharpe Cat. B. M., F. B. I., i, p. 366.
*Ianthocincla cineracea*, Oates, F. B. I., i, p. 85.
*Description* as in Oates, F. B. I.
*Distribution.*—E. Manipur, Naga and Chin Hills to Mt. Victoria.

[I have eggs of this species from Colonel Tytler which I believe to be quite well authenticated. In colour these are pale blue-green and in shape and texture similar to the eggs of *Trochalopterum virgatum* and *lineatum* from which they could not well be distinguished. They measure on an average ·98″ × ·72″. Colonel Tytler was good enough to send me nests, eggs and birds from the Naga Hills where he took a considerable number at an elevation between 4,000 and 6,000 feet.—E.C.S.B.]

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* *Allied sub-species*—
*I. ocellata maxima.* (J. Verr.) N. Arch. Mus. VI. Bull. p. 36 (1870).
*Distribution.*—Monpin, S. Kansu, and W. Szechuen, China.
*I. ocellata bieti*, Oustalet, Bull. Mus. Paris. VII, p. 163 (1897).
*Distribution.*—Upper Mekong.
*I. ocellata artemisæ*, (David) Ann. and Mag. Nat. Hist (4)VII, p. 256 (1871).
*Distribution.*—Szechuen and S. Kansu, China.
*I. ocellata lunata*, J. Verr. Nouv. Arch. Mus. VI. p. 36 (1870).
*Distribution.*—W. Szechuen, Monpin and S. Kansu, China.

† *Ianthocincla cineracea cinereiceps*, Styan, Ibis. 87 p. 167, 1887.

Similar to *I. c. cineracea*, Godwin-Austin, differs in having the cap greyish to blackish; the ear-coverts white; upper plumage tinged with brown; breast tinged with vinous pink.

*Distribution.*—Szechuen, and Foh-kien, China.

[The only egg I have seen of this species is one I obtained from the Styan collection. It was taken at Kuatun in 1895 and is somewhat faded and discoloured and it could hardly now be distinguished from eggs of *Garrulax moniliger*. It measures 1·10″ × ·88″ and is a rather long narrow egg.—E. C. S. B.]

*Ianthocincla cineracea styani*, Oustalet, Bull. Muss. Paris, (1898). No. 6, p. 226.
*Distribution.*—Yunnan.

### IANTHOCINCLA RUFIGULARIS RUFIGULARIS, Gould.

*The rufous-chinned Laughing Thrush.*

*Ianthocincla rufigularis*, Gould, P.Z.S., 1835, p. 48; Oates, F. B. I,i., p. 86; Harter, Pal., Vog i., p. 634.

*Trochilopterum rufigulare*, Sharpe, Cat. B. M., VII, p. 365.

*Description* as in Oates, F. B. I. where Mr. Oates points out the differences between the birds of various localities.

*Distribution*—The Central Himalayas, Nepal and Sikhim.

### IANTHOCINCLA RUFIGULARIS ASSAMENSIS, Hartert.

*Hartert's Laughing Thrush.*

Hartert Pal., Vog. i., p. 635. (1910.)

Differs from *I. r. rufigularis*, in having the whole throat rusty red for about one inch. The size is also smaller; and ear-coverts brown.

Bill 2 m.m. shorter, Wing 91-94 m.m.

*Distribution.*—The Patkoi, Khasia and Garo Hills, 'Assam.

*Nesting.*—[The nest and eggs do not differ from those of the Nepal Bird. This form was very common in N. Cachar and I took many nests and eggs. A large series of the latter average 1·12″ × ·80″ and are pure white of a rather dull texture, seldom showing any gloss.—E. C. S. B.]

### IANTHOCINCLA RUFIGULARIS OCCIDENTALIS, Hartert.

*The Kashmir Laughing Thrush.*

Hartert, Pal., Vog. i., p. 635. (1910.)

Similar to *I. r. rufigularis*, but has the upper plumage paler, and ear-coverts rusty orange.

*Distribution.*—North-West Himalayas, from Kumaon to Kashmir.

### IANTHOCINCLA AUSTENI AUSTENI (Jerdon).

*The Cachar Laughing Thrush.*

*Trochalopterum austeni*, Godwin-Austen, J. A. S. B. XXXIX pt. II, p 105 (1870); Sharpe, Cat. B. M. VII, p. 369.

*Ianthocincla austeni*, Oates, F. B. I., i., p. 87.

*Description* as in Oates, F. B. I.

*Distribution.*—Khasia and Cachar Hills, Assam.

*Nesting.*—[The nest and eggs are similar to those of *I. rufigularis* but the eggs are a trifle smaller on an average being about 1·08″ × ·78″.—E. C. S. B.]

### IANTHOCINCLA AUSTENI VICTORIÆ (Rippon).

*The Chin Hills Laughing Thrush.*

Rippon, Bul. B. O. C. XVI., p. 47, (1906.)

Similar to *I. a. austeni* (Jerdon). Differs in having the under parts much whiter, the feathers from the chin to abdomen having broad white edges.

*Habitat.*—The Chin Hills on the west of Burma.

### STACTOCICHLA (Sharpe), 1883.

Oates, F. B. I. i., p. 104.

This genus consists of only one bird characterised by its long straight bill, and long rictal bristles and its very thrush-like spotted breast.

### STACTOCICHLA MERULINA (Blyth).
### *The Spotted-breasted Laughing Thrush.*

*Garrulax merulinus*, Blyth, J. A. S. B. XX., p. 521. (1851.)

*Stactocichla merulina*, Sharpe, Cat. B. M. VII., p. 449; Oates, F. B. I., i., p. 104.

*Description and Distribution* as in Oates, F. B. I.

*Nesting.*—Stuart Baker says it breeds all over the N. Cachar and Manipur hills above 3,000 ft. Building a compact shallow cup, and lays from 2 to 3 eggs. These are a beautiful blue-green, similar in colour to eggs of *G. moniliger*, but with a totally different texture. In shape broad ovals which average 1·18″ × ·83″ to 1·14″ × ·82″.

### GRAMMATOPTILA (Reichenb.), 1850.

Oates, F. B. I., i., p. 102.

"The two birds of this genus may be recognised by their stout, short, deep bill, striated plumage, and by the long frontal hairs which reach over the nostrils."—(Oates).

### KEY TO SUB-SPECIES.

(*a*) Feathers of crest *streaked* with white, no brown band on the sides of the head .. .. .. *G. striata striata.*
(*b*) Feathers of crest *not streaked* with white, a brown band on the sides of the head .. .. .. *G. striata austeni.*

### GRAMMATOPTILA STRIATA STRIATA (Vigors), 1830.
### *The Striated Laughing Thrush*
### and
### GRAMMATOPTILA STRIATA AUSTENI (Oates), 1889.
### *Austen's Striated Laughing Thrush.*

*Description and Distribution* as in Oates, F. B. I.

It appears to be doubtful whether this species lays spotted eggs or not. Mr. Stuart Baker says he has never seen any spotted eggs of this species.

[The nest and eggs of *austeni* do not differ in any way from those of *striata*. The breeding season is April and May in the Khasia Hills.—E. C. S. B.]

### GARRULAX CINEREIFRONS, Blyth.

This species which is peculiar to the Island of Ceylon, is quite distinct from any other Laughing Thrushes in having the feathers of the forehead rounded and short, and for this reason was placed by Oates in *Crateropus*. In style of plumage it is Garrulacine, and approaches *G. delesserti* in coloration, and I consider it should be placed in a sub-genus by itself. I have carefully examined all the numerous "Laughing Thrushes" from the Oriental region and can find none approaching it.

Its characteristics are, a slighty curved bill with oval exposed nostrils, with no overhanging hairs or bristles; and the feathers of the forehead, short and rounded.

### GARRULAX CINEREIFRONS, Blyth.
### *The Ashy-headed Laughing Thrush.*

*Garrulax cinereifrons*, Blyth, J. A. S. B. XX., p. 176 (1851); Sharpe, Cat. B. M. VII., p. 447.

*Cratheropus cinereifrons*, Oates, F. B. I. i., p. 114.

*Description* as in Oates, F. B. I.

*Distribution.*—The Island of Ceylon. Nothing appears to be known about the nesting or habits of this species [though the eggs have been described as white, a most unlikely colour for them to be if the bird is considered a *Crateropus*.—E. C. S. B.]

(*To be continued.*)

# THE COMMON BUTTERFLIES OF THE PLAINS OF INDIA.

## (INCLUDING THOSE MET WITH IN THE HILL STATIONS OF THE BOMBAY PRESIDENCY).

BY

T. R. BELL, I.F.S.

(*Continued from page* 531 *of Volume XXII.*)

## PART XVI.

### Genus—COLOTIS.

This genus is Ethiopian and Indo-Malayan in distribution; in the limits of British India seven good species are recognized besides some not very well-defined races. The colours of the members of the genus are characteristic: salmon or white, always with a diagonal black bar across the apex of the forewing outside which, in the white species, there is a red or yellow patch. The black bar may be obsolescent, especially in the dry-season specimens, but is always indicated; the red or yellow patch may be faded to white in some females. All species are plentiful in the Plains though *protractus* is somewhat local and seemingly confined to Baluchistan, Sind, the Punjab and Cutch. None are found ordinarily in mountainous tracts, in heavy forest regions where the rainfall is abundant; they want plenty of sun, open country and, perhaps, not too much moisture in the air. However, the distribution probably altogether depends upon the absence or presence of the food plants of the caterpillars.

**116. Colotis amata.**—(Pl. J., fig. 68.)—Male, *upperside*, salmon-pink. Forewing; costa black, thickly overlaid with greyish or pinkish scales, a black spot at apex of cell which may be large and quadrate or smaller and lunate; termen broadly black with an enclosed, double series of spots of the ground-colour—the inner series consists of a large spot in interspace 1, two very small spots in interspaces 2 and 3, one in each, and four larger, anterior spots placed in a curve; the spots in the outer series are variable in number but, generally, there is one in each interspace, these are more or less linear in shape. Hindwing: a band on costal margin extended to just within the upper margin of cell, covered with dense, black, specialized scales; this band joined on to a broad, similarly-coloured, terminal band of ordinary scales, that becomes more or less diffuse and powdery posteriorly and encloses a double series of small spots of the ground-colour, the inner series often obsolescent; in some specimens entirely absent; dorsum heavily irrorated with fuscous scales, the irroration extended on to the disc which has, therefore, a greyish appearance. *Underside*: greenish yellow; an anteciliary, fine, black line on both fore and hindwings; the black markings of the upperside show through by transparency. Forewing: a black spot, variable in size and intensity, in some specimens absent altogether, at apex of cell; a subterminal, quadrate, black spot in interspace 1 and another (sometimes faint or absent) further outwards in interspace 2; disc faintly, dorsal margin broadly, pale salmon-pink. Hindwing: the whole surface sparsely irrorated with minute, black scales; a small, black, discocellular spot. Cilia of both wings pale salmon-pink. Antennæ, head, thorax and abdomen black, the antennæ speckled with white, the head and thorax covered with greenish-fuscous hairs; beneath: the palpi green, thorax and abdomen white. Female dimorphic. *1st Form, upperside*: ground-colour paler than in the male, in some specimens quite ochraceous outwardly; all the markings similar but duller in tint; the hindwing of course without the black, costal band of specialized scales, the ground-colour extended up to the costal margin. *Underside*: similar to that of the male but the ground-colour very much paler and more ochraceous than green. In some specimens, in addition to the black spots in interspaces 1 and 2 on the forewing, there is an anterior, postdiscal, fuscous, curved band. Hindwing: discocellular spot larger than in the male and annular; a curved, discal series of reddish or pale ferruginous spots from costa to dorsum. *2nd Form*: similar to Form 1 but the ground-colour pale primrose-yellow to pure white. Antennæ, head, thorax and abdomen in both forms as in the male. Expanse 40-50mm.

*Egg.*—In shape it is a truncated cone, twice as high, or slightly more, as broad, with longitudinal channels and fine, transverse striæ; colour white at first, turning yellow later on.

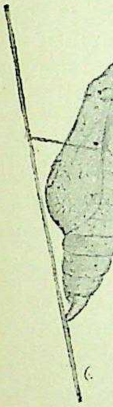
*Larva.*—When it emerges from the egg it is nearly quite cylindrical with a shiny, black, smooth head covered sparsely with white, erect hairs; the body is light greenish yellow-brown, rather oily looking, with a row of tubercular hairs along front margin of each segment; there are no points at end of anal segments.

*2nd stage.*—The same but the clypeus light in colour; the body now with many extra smaller hairs all over except on segments 2, 3.

*3rd stage.*—Head generally green, sometimes marked with brown, with white, erect hairs from tubercles; eyes brown. Body oily green, covered with short, light-coloured, bristle-like hairs with no sign of tubercles; along front margin of segment 2 is a row of 8 erect hairs, each one bearing a globule of dark brown liquid at its extremity and rising from small tubercles which are the same colour as the body; segment 3 has 6 similar hairs across the middle (transversely to the length of the body); the others have 8, one subdorsal, one dorsolateral, supraspiracular and subspiracular on each side; the anal segment is rounded at end, very slightly indented in middle of hinder margin; there is a commencement of a dorsal, white band on anterior segments (often a complete one the whole length of larva) and an obsolescent, spiracular, white line.

*4th stage.*—Head green; body green also but no longer oily looking; the rest the same as in the 3rd stage.

*5th stage.*—The caterpillar is of the same shape as that of *Colotis vestalis*. It has the same round head, the large triangular clypeus has somewhat outward-curved lateral sides and is green, covered with very minute, cylindrical, white tubercles in the same way except that here the tubercles are at a distance of at least three, perhaps four tubercle-diameters one from the other and the hair on each is dark brown, fairly long and erect, hardly pointing down at all; the eyes are white-glassy, marked with brown; the jaws are brown-tipped; the labrum, ligula, antennal joints are green. The *spiracles* are oval, of ordinary size, light brownish, those of segments 2 and 12 hardly larger than the rest. The *surface* of the body is lined transversely with the usual 7 lines to each segment and each ridge thus formed is set with minute white tubercles like the head, spaced similarly and bearing exactly similar dark hairs, one transverse (to body, along each ridge) along centre of each ridge; the main subdorsal, dorsolateral and supraspiracular tubercle no larger than the rest, the hair on each, however, slightly longer, blunt-ended and generally bearing a drop of dark liquid; the hairs in spiracular-ventral region fine, white and some of them somewhat longer. The anal flap is trapeze-shaped, square-ended and rather thick, the square end being ever so gently concave. The colour is a fine rich grass-green, rather bright, with a broad, white dorsal line generally showing the transverse lines of the segments (the 7) as slight depressions throughout its length; this dorsal line often reaches from the anterior margin of segment 2 to the anal flap, sometimes it is more or less indistinct but generally present on the first few segments; there is, besides, sometimes, a fine light, very thin, spiracular line; the belly is light glaucous-green as well as the prolegs; the feet are the same with brown hooklets; the true legs are shiny light greenish. L: 20mm; B: 3mm.



× 2.

*Pupa.*—(*v.* marginal figure).—The chrysalis is of the *Terias* type with wings ventrally prominently bulged out in a curve along their suture-line, the thorax humped, the head produced into a "beak" in front, the abdomen circular in transverse section from end of wings, thinning in segments 10 to end. Here the ventral bulge of the wing-suture line is not very accentuated, the apex of the curve being situated at about ⅗ its total length from front end of pupa to the front margin of segment 9, where it ends; the beak is conical, equilateral, its base being reckoned as the whole pupal diameter at front margin of segment 2; the real beak is only the very extremity of this cone and it is very short; segment 2 is about half the length of this cone, has its surface parallel to the pupal longitudinal axis, its front margin dorsally curved concavely and gently backwards, the hinder margin curved gently forwards towards it; the thorax is twice the length of segment 2, only gently "humped," has its surface (taken as the plane subtending the hump-curve) parallel to pupal axis and its hinder margin a gentle curve meeting the wings in a shallow, sharp angle considerably less than 90°; the lateral outline is nearly absolutely parallel from shoulders to segment 8, these lines converge gently from shoulders to eyes, then meet in the beak; the wings are thus only slightly expanded laterally; the cremaster is nearly square, gently concave at end, depressed dorsally between little-prominent, subdorsal ridges, slightly depressed ventrally between the rounded marginal ridges, each hardly-prominent extensor-ridge ending in a little point or sharp tooth anteriorly; the suspensory hooklets are arranged in a dense mass all along the posterior margin. *Spiracle* of segment 2 a mere linear indication, the others white, oval, of usual size, flush. *Surface* of pupa finely aciculate-corrugated all over, somewhat punctate on abdomen. Colour green with the lateral outline along wings yellow; there is always a black spot on the discocellulars and the black spots at end of veins of hindwing show through indistinctly. L: 16 mm; B: 3·5 mm. Depth at apex of wing-curve: 4 mm.

*Habits.*—The eggs are laid on the upperside of the leaf, from 50 to 60 in a batch, each egg separate and without apparent order. The larvæ are gregarious throughout their existence, eat voraciously and grow extremely rapidly. Eggs obtained on the 25th July 1903; larvæ emerged next day; changed to pupæ on the 2nd of next month at night (some next night) and the imago emerged on the 6th August 1903. The caterpillars feed in rows along the edge of a leaf, lying closely pressed one against the other and continue this up to the last stage when they become more independent but still keep together in batches. The pupation takes place in the ordinary way, each larva going off by itself beforehand; so that the pupæ are never found together. The little larva eats its way out through the side near the top and always makes its first meal of the shell. The separation of the larvæ into batches later on is determined by the carrying space of the leaf; when the crowd becomes too large for one, it breaks up into parties, and, before pupation, as already remarked, each individual goes its own way. Some of the larvæ grow much slower than the others, depending chiefly upon the greater or less ability to obtain sufficient food within a given time. At the commencement of life the little caterpillars as often as not sit on the underside of the leaf while feeding; there does not seem to be any preference for the upper or the underside. The butterfly is not a strong flier, keeps nearly always near to the ground though of course it rises to the tops of the food plants when looking for females or, more seldom, when seeking a place to lay its eggs; the flight is fluttering and, except when engaged in business, fairly straight ahead and horizontal. The insects are not often found frequenting flowers; they often rest with the wings held partially open, on the top of a leaf in the sun; but repose, with them closed over the back, at night and in rainy weather, on a stem, twig, underside of a leaf, grass-stalk, &c., in thickets and amongst the undergrowth. They like open places and are fond of the sun like others of the genus; but are never found in the jungles along the Ghats. The reason for this is the absence of the food-plant which is essentially a species of waste, desert places. The larva feeds upon *Salvadora persica* and *oleoides* as well as upon *Azima tetracantha*, all belonging to the *Salvadoraceæ*. The first is found along the sands on the Bombay sea-coast about Bandra and also in Kanara further south; the butterfly is found there too; in the latter District it is the only place where it exists; its distribution is given as continental and peninsular India but not in Bengal and Ceylon. Outside British India it is found in Aden, probably throughout Arabia, in Madagascar and Tropical Africa.

In a brood of, say, 50 individuals there will always be a couple of white females and this seems to be quite independent of climate as such have been bred both in Bijapur in the Bombay Presidency where the rainfall is very scanty, the jungle nil and the country flat, and in Kanara on the sea-coast where the rainfall is over 100 inches with plenty of hills and jungle close to. However, in the damp places the black markings on the upper sides of the wings in all specimens are larger and more intense.

**117. Colotis protractus.**—Male, *upperside*: rich salmon-pink. Forewing: base bluish-grey; a band along the costal margin black and joined on to a very broad, similarly-coloured band on termen that occupies the outer fourth of the wing; inner margin of terminal band irregular, extended slightly and squarely inwards in interspaces 1a, 1 and 3; a prominent, oval, discocellular, black spot extended downwards from the black on the costal margin; apex with elongate, bluish-grey spots in interspaces 3, 4, 5, 6 and 9 superposed on the black, terminal band. Hindwing: dorsum white; terminal half of wing jet-black; a somewhat diffuse, subdorsal band of bluish-grey scales from base to the black on terminal margin. *Underside*: a beautiful light, greenish-yellow; disc of wings tinged with salmon-pink, conspicuous on the fore, more obscure on the hindwing. Forewing: a prominent, black, discocellular spot and a subterminal series of three more or less quadrate, black spots that decrease in size anteriorly in interspaces 1, 2 and 3, the spot in interspace 1 extended into interspace 1a and lengthened posteriorly outward to the terminal margin. Hindwing uniform. Cilia of both wings pale salmon-pink. Antennæ brownish black, ringed or spotted with white; head, thorax and abdomen black, the thorax anteriorly with whitish hairs at the sides; beneath: the palpi, thorax and abdomen pale yellow. Sex-mark: a small, glandular patch of scales near the base of interspace 1 on the underside of the forewing, sometimes visible on the upperside.—Female, *upperside* ground-colour similar; the markings similar but the black along the costa and termen of forewing and of terminal half of hindwing dark, silky brown; on the forewing edged interiorly along the costa and along the termen from vein 2 upwards with jet-black; discocellular, black spot on the forewing much larger than in the male. *Underside*, forewing: base and cell anteriorly greenish yellow, disc salmon-pink; apex and termen broadly dull, ochraceous pink; discocellular and posterior, subterminal spots as in the male. Hindwing uniform ochraceous pink. Antennæ, head, thorax and abdomen as in the male, but somewhat duller in colour. Expanse 38-50 mm.

In Miscellaneous Note "No. XXIV.—Notes on *Colotis* in Sind" by Captain F. C. Fraser, I.M.S., dated Hyderabad, Sind, September 1910, which appeared in this Journal there is a description of the stages as under:—

*Egg.*—" Pure white, ampulliform in shape, strongly ribbed. Hatch out on the third day."

*Larva.*—" Grass-green, at first a crimson stippling along the sides but this gradually fades in successive moults until finally lost in the last. The final skin has a peppering of white, minute dots and tiny bristles covering the skin. There is a white, dorsal line along the back which may or may not have a yellow edging. In shape, cylindrical, like that of *T. hecabe.* This larva is interesting in that it is the only one of its genus (so far as the Indian forms are concerned) that has not got a black head when first emerging from the ovum."

*Pupa.*—" Creamy, flesh-coloured or pale green with no markings; body stout, with a stunted point at the head. Suspended upright by waist-belt and anal attachments."

*Habits.*—The eggs are laid singly on the food plant. The larvæ thus live singly also. Their habits are not likely to differ in any way from those of *vestalis.* Captain Frazer states in the above notes that he has taken *Colotis protractus* (and *vestalis*) male joined to a female *amata* but unfortunately was not able to obtain eggs of the latter. He says that he has caught a specimen of *protractus* in which the salmon-colour of the wings was replaced by the creamy white of *vestalis*; and he is evidently of opinion that hybridism plays a considerable part in the variations in colouration existing in *amata*, *vestalis* and *protractus*. The food plant of the larvæ of *protractus* is *Salvadora persica* (probably also *oleoides*, the other species of the genus *Salvadora*). The butterfly is found in Baluchistan, Punjab, Cutch and Lower Sind (perhaps all along the Indus throughout Sind).

**118. Colotis phisadia.**—Male, *upperside*: forewing: pale salmon-pink, this colour paler outwardly; base heavily irrorated with bluish-grey scales that extend outwards and are merged with a black patch that occupies the apex of the cell and spreads along the discocellulars; terminal third of wing black with enclosed spots of the ground-colour in interspaces 3, 4, 5 and 9, the spot in 4 sometimes absent, the inner edge of the black area emarginate at interspaces 2 and 4 ; the outer margin with a series of minute terminal specks of ground-colour in the interspaces. Hindwing white, base heavily irrorated with bluish-grey scales that are extended downwards in a diffuse band parallel to the dorsum; terminal half of the wing jet-black. *Underside*: precisely as in male *protractus*.—Female: very variable, but resembles the male in markings. On the *upperside*, however the terminal areas on both wings that are black in the male are silky brown on the forewing, the inner, sinuate margin of the same posteriorly black; on the hindwing the terminal, brown area encloses an irregular, sinuate, black band that does not extend either to the costa or to the dorsum. The ground-colour in some specimens is faintly pink fading to white outwardly; on the hindwing it is white as in the male. In other specimens the ground-colour of both wings is entirely white or pinkish orange. *Underside*: as in the male, but the apical area of the forewing and the whole surface of the hindwing tinged more or less with ochraceous. In many individuals, probably of the dry season broods, this ochraceous tint is very much marked. Forewing: with posterior, black spots as in the male. Hindwing: an irregular, discal, sinuate, macular, brown band that is often obsolescent. Antennæ, head, thorax and abdomen much as in the male. Expanse 38-46 mm.

*Larva*.—"Pea-green when young, two black spots on the back of the head, a white mark, almost the shape of an ace of diamonds but rather longer, on the second segment; when older, the black spots on the head disappear and the white mark gets clearer and is outlined with black. There are two similar marks just beyond the centre of the back, the front one being the smaller, and another, similar mark on the 11th segment." (*Nurse.*)

*Pupa*.—As figured: is stout, pale brown, more or less mottled with darker brown; in shape mainly cylindrical, with the wing-cases moderately developed; the head ends in a very sharp point.

The above descriptions are taken from Colonel Bingham's book.

*Habits*.—Nothing much is known; Nurse states that the larva feeds upon *Salvadora persica*, like that of *amata*. The only recorded occurrence of the species within British Indian limits are in Surat and Multan. It is found in Arabia and the opposite African coast.

**119. Colotis vestalis.**—*Wet-season brood*.—Male, *upperside*: white; fore and hindwings with broad, terminal, black bands. Forewing: base, costal margin broadly and discoidal cell except at its lower, apical area heavily irrorated with dusky-grey scales; a short streak at upper apex of cell joined to a large spot on the discocellulars, black; superposed on the black, terminal area are two small, preapical spots (sometimes wanting) and a much larger, subterminal spot in interspace 3, all white; minute, terminal specks also, often more or less obsolescent, in the interspaces. Hindwing: more uniform, very slightly irrorated with grey scales at base, the black, terminal band immaculate. *Underside*: greenish yellow sparsely sprinkled with black scales, the yellow very pale on the disc of the forewing fading to white on its dorsal margin; discocellular spots and three subterminal, posterior spots that are placed in a curve, black; the lowest spot of the three sometimes extended to the dorsal margin (var. *puellaris*). Hindwing uniform, with a very small, annular spot on the discocellulars. Cilia white. Antennæ, head, thorax and abdomen black, the antennæ speckled and tipped with white, the thorax clothed with long, bluish-grey hairs; beneath: palpi, thorax and abdomen white. Female, *upperside*; very similar to the male, the terminal bands brownish rather than black. *Underside:* base and cellular area on forewing white suffused with greenish yellow; costa and apex of fore and the whole surface of the hindwing pale ochraceous; the forewing with the black spots as in the male, the hindwing, in a few specimens, with an anterior, post discal, sometimes somewhat obscure, macular, incomplete band (indications of the same in some males).

*Dry-season brood.*—Male and female: similar to male and female of wet-season brood but on the upperside the black markings are duller in tint and narrower, while on the underside in both sexes the costal and apical areas on the fore and the whole surface of the hindwing vary from pale ochraceous to dark reddish-ochraceous. Expanse 40-50 mm.

*Egg.*—The egg is white when laid, then turns yellowish and gets three, more or less regular, very broad, reddish bands round it: the first just above the base, the second round the middle, the third a quarter of the height below the top. The shape is like a long dome; there are 16 to 18 longitudinal ribs from base to top, 12 of which actually reach the top where their points form a low crown round the micropyle; the ribs are prominent and more or less triangular in section, the intervals being very distinctly striated with numerous parallel ridges; the space round the micropyle is smooth for a short distance; the surface of the egg is shiny. H. 0·8 mm.: B. 0·3 mm.

*Larva.*—The larva is somewhat more narrowed than that of *amata* in segments 2, 13, and 14; it is stout and cylindrical in segments 4-12; the head is slightly broader than segment 2, round from front view with the neck rather distinct and is somewhat flattened on face; the clypeus is large and triangular; the surface is dull and covered with minute, whitish tubercles from each of which springs a short, semi-erect, dark hair; the colour is grass-green with the labrum white but slightly washed with brown; the jaws, somewhat broadly black-tipped, and the second antennal joint also white; the labrum green and shining; the basal antennal joint green; the eyes brown. The surface of the body is dull, soft-looking, covered somewhat sparsely with minute, dull, light-yellow and whitish spots and many soft, short, lightish hairs which are not readily visible to the naked eye except along the subspiracular region where they form a whitish-looking, short fringe visible in some lights. Spiracles are small, brown-pink, oval, placed on an indistinct, lightish, spiracular line. Anal flap rather large, dorsally somewhat flattened, somewhat flanged round edges, trapeze-shaped, the dorsal slope being slight. The colour of the body is a fine grass-green with an indication of a spiracular light line; the ventrum somewhat lighter in shade as well as all the true legs and claspers. All legs and claspers are rather small and the anal ones are hidden from above by the over-reaching anal flap. L: about 20 mm.; B: 4 mm.

The yellow body-spots are really minute tubercles, one subdorsal, dorsolateral and supraspiracular to each segment, each bearing a short, dark, erect hair ever so little longer than the other lighter body-hairs (though shorter than the fine, soft, subspiracular fringe) and there is a small, bare space round each such tubercle. Captain Frazer (*vide* above under "*Colotis protractus*") states that "first skin bears a shiny, jet-black head; body grass-green with crimson stippling laterally which, in the posterior three segments spreads upwards and meets that of the opposite side, so as to form a more or less prominent, crimson patch. This stippling fades during succeeding moults and is entirely lost after the last. The black colour of the head gradually passes off also; after the first moult it is present as a crown to the green head, this crown grows smaller and is entirely lost after the final moult. The final skin is identical with that of *protractus*; when mixing the two together I have been quite unable to say which was *vestalis* and which *protractus*."

*Pupa.*—The pupa is of the type of *Terias hecabe* or *Colotis amata*; but it is rather stout and the head-point or snout is shorter than usual and somewhat bluntly rounded at extremity. The pupa is somewhat distinctly constricted behind the thorax both dorsally and laterally; the wing edges laterally are also slightly more thickened; the vertex of head is slightly more inclined in its dorsal line to the longitudinal axis of pupa that segment 2 and the head-snout has its dorsal line nearly parallel to that axis: differing therein from the pupa of *amata* in which the dorsal line of all three is nearly straight; the abdomen is shorter comparatively than in *amata*; the pupa is thickest in the middle, whereas, in the species just mentioned, the pupa is, if anything, thickest at shoulders; otherwise the two pupæ are similar as to surface and general appearance—except that, here, the cremaster has the subdorsal ridges more clearly defined, the surface being depressed between them as well as outside them. The colour is a pinkish bone-colour with a darkish dorsal line and some darkish marks on the dorsolateral region of abdomen as well as at the apices of wing-veins. L: 15·5 mm; B: 4·5 mm.

Captain Frazer notes that the pupa is "identical with that of *protractus*, usually flesh-coloured and without markings."

*Habits.*—The eggs are laid singly and generally near the base of the plant on old leaves; otherwise the habits are the same as for *amata* (except that here the larvæ are not gregarious); the pupa is more closely attached to the surface; the larva is sluggish and generally wanders away from the leaves to pupate. The imaginal habits are much the same as for *amata* in every way; the butterflies are fond of the bright sunshine in the mornings from 10 to mid-day and may then be found in numbers in Sind wherever the foodplant exists. It is commonest in the monsoon months up to the middle of September after which the numbers decrease. The upper or under surfaces of leaves are chosen indifferently for oviposition. Captain F. G. Frazer, I. M. S., says that, in Sind, in the month of July 1910, he took a female *amata* connected with a male *vestalis*; and, a week later, repeated the experience; and he states that he has caught a female *vestalis* in which the whole discal areas are suffused with the salmon-buff of *protractus*, as well as a specimen of this latter species in which the whole ground-colour is replaced by the creamy white of *vestalis*; these he regards as hybrids. The food-plant of *Colotis vestalis* is *Salvadora persica* and its distribution is Baluchistan, the Punjab, Cutch, Sind, Rajputana, the Central Provinces; and outside India, the Provinces round the Persian Gulf.

**120. Colotis fausta.**—Male, *upperside*: Salmon-buff, paler in specimens from desert areas, darker in regions where there is a regular though not heavy rainfall. Forewing: base and costal margin irrorated in varying degree with dusky scales; an oval, annular, discocellular spot that varies in size; a black, festooned, postdiscal fascia that extends from costa to vein 4, beyond which the veins are margined with black; this fascia broadened subterminally into a second transverse fascia that is followed by a very fine black line on the extreme terminal margin. In specimens from desert regions the transverse fasciæ and the black edging to the veins are narrow, but in moister areas the two transverse fasciæ unite posteriorly and with the slender, black, terminal line give an appearance as of a double, black series of spots of the ground-colour enclosed between them. Hindwing: more uniform, the veins with terminal, black spots; costa broadly pale, fading to white. *Underside*: pale yellowish white, in many specimens from moist localities suffused with a beautiful rosy flush; the markings in such specimens prominent, in those from dry localities more or less obsolescent. Forewing: discocellular spot as on the upperside but complete, and not an oval ring; in some specimens a postdiscal, dark ochraceous brown narrow, curved band from costa to middle of interspace 2. Hindwing: a small discocellular spot in the form of an oval, light brown ring always much smaller than that on the forewing; a postdiscal, curved, more or less sinuate band, similar to and in continuation of the band on the forewing from costa to vein 1. Antennæ, head, thorax and abdomen dusky black, the club of the antennæ on the underside, the hairs that cover the head and thorax and the scaling of the abdomen salmon-buff; beneath: much paler, fading to white in specimens from dry localities. Sex-mark: a small patch of brown, specialized scales on the underside of the forewing above vein 1, closer to the base than to the termen; on the upperside this is more or less prominent as a raised spot.

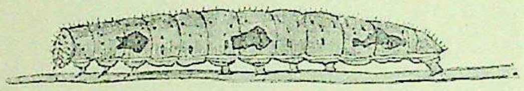
Female is dimorphic. *Form 1*: ground-colour and markings as in male; the costa of the hindwing on the upperside concolorous with the rest of the wing; the sex-mark of course absent. *Form 2, upperside*: ground-colour white, often more or less irregularly suffused on parts of the wing with salmon-buff; markings like in male though very much broader. Forewing: base and costal area heavily irrorated with greyish-blue scales. Hindwing: the terminal spots at apices of the veins large and quadrate, often united into a continuous band which then encloses an anteciliary series of spots of the ground-colour. In a few specimens there are traces of a post discal, macular, black band, in a very few this band is almost complete and very prominent. *Underside*: ground-colour white, markings as in male but broader, darker and more prominent. Expanse: 46-58mm.

The race *tripuncta*, Butler, is described as follows:—

Male and female: very closely resemble the typical forms; but this, the southern form, can be distinguished as follows:—Male, *upperside*: ground-colour a much deeper tint of salmon-buff, almost orange-yellow. Forewing: the costa heavily irrorated with black scales; discocellular spot larger, not annular; postdiscal, black fascia at all seasons united to the subterminal fascia and black, anteciliary line so that the whole apex and termen of the wing are black, broadly at the costa and gradually narrowed towards the tornal angle. This black area encloses never more than three preapical, moderately large spots and a complete series of minute, anteciliary specks of the ground-colour. Hindwing: as in *fausta*, but the terminal black spots very large. *Underside*: ground colour of a richer, yellower tint than in the typical form; markings similar, those on the forewing dusky black, on the hindwing rose-pink. Antennæ, head, thorax and abdomen and sex mark as in the male of the typical form. Female, *upperside*: closely resembles the female *Form* 2 of *fausta*, but all the markings are darker and conspicuously broader, while the number of preapical spots of the ground-colour enclosed within the black area on the forewing is never more than three, the same as in the male. *Underside*: forewing: white, sometimes faintly suffused with yellow; apical and terminal areas anteriorly light to dark ochraceous yellow; discocellular spot very large; transverse, postdiscal, macular, dark reddish-brown band very broad. Hindwing: pale, ochraceous yellow, sparsely powdered with black scales; transverse, post-discal, macular band reddish-brown and broad as in the forewing. Antennæ, head, thorax and abdomen as in female *Form* 2 of *fausta*. Expanse 52-58 mm.

The males of *C. fausta* and, therefore, of course, also of *tripuncta* can at once be distinguished from their females by having, in addition to the sex-mark of specialized scales and darker colouring, the dorsal margin of forewing curved convexly, the curve forming a considerable lappet over the subcostal area of the hindwing. In the female this dorsal margin is nearly quite straight. (K. Bernhardt in Journal B. N. H. S., Vol. XIX, Part 1, published 15th April 1909.)

*Egg.*—The egg is of the usual short-necked bottle shape, the narrow top part rather exceptionally short; with 18 meridional ridges meeting in a thickened ring round the top, their extremities not showing at all as teeth and hardly a single pair anastomosed. The surface throughout finely transversely striated and shining. The colour white when laid, turning yellowish shortly afterwards with three blood-red, rather irregular bands round it, the first some way above the base, the second about the middle, the third just before the narrowing commences. L: 0·7mm; B: 0·35mm. Laid anywhere on a leaf and generally on an old one; or on a stalk, twig, &c.



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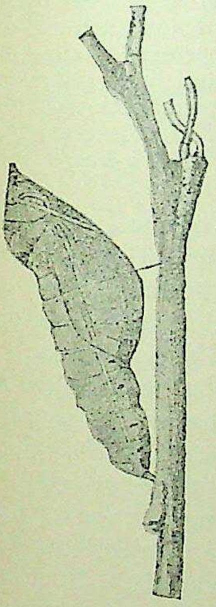
*Larva*—(*Vide* marginal figure).—The larva is of the type of that of *Colotis eucharis* except that it has not got the differentiated tubercles (in point of size) found in that species; the covering of hairs is far more like that obtaining in *Colotis danæ, i.e.*, it is rather denser than in *eucharis* and the main tubercle hairs are not much longer than the rest. It differs from the larva of this latter species however in the markings, having much more lateral, light pinkish-brown patching than the patched larvæ of that ever have. It is also of course larger when full-grown. The shape is that of *C. eucharis* as said, but segment 13 is perhaps longer here, and the anal segment certainly is longer and it is perhaps also more concavely emarginate (though, even so, only shallowly) at extremity, the emargination affecting the whole terminal margin; the segment is also perhaps not quite so thickened at extremity. The *head* is round, not large, though nearly as broad as segment 2 the straight front margin of which slightly infringes on the vertex; the clypeus is large and triangular, the false clypeus arching over, and including the apex (the sides of true clypeus quite straight); the surface of the head is covered with quite short, dark-brown, semi-appressed hairs but in no way so closely as to hide the surface, all pointing downwards and the tubercles (white) they rise from are hardly visible even with the lens they are so minute; otherwise the surface is smooth and hardly shiny; the labrum is longitudinally (to body-length) corrugate, green; the ligula large as usual, pinkish; the antennal basal joint is green, shiny, the second joint brownish; the mandibles dark at ends; the eyes glassy, very slightly stained with brown. *Spiracles* are oval, the centres green surrounded by a somewhat broad, hardly raised, brown margin; those of segments 11 and 12 (and not 2) larger than the rest as in the larva of *Colotis danæ*. The *surface* of body is transversely lined on each segment by 6 parallel lines, the first being some distance behind the anterior margin each time, the intervals between all others being equal; the whole surface covered somewhat closely by very short, fine, whitish hairs (except on segment 2 where they are rather dark) rising from barely visible, minute, white tubercles; the main subdorsal, dorsolateral and supraspiracular one on each segment being about twice the length of these (still very short therefore), dark, rather thicker with the usually rounded end (where the drop of liquid rests); as usual, also, there are longer (only slightly here however), fine, light hairs in the subspiracular region and lateral ventral region; still longer ones at the extremity of anal flap where each one is also thicker and dark. The *colour* is a rather fine rich green dorsally with, sometimes, a dorsal, clear yellow, narrow band continued on to the vertex of head; the belly, true legs and claspers much lighter and glaucous; the feet lobed, the hooklets brownish; there are generally three (there may be 11 of them, one on each segment 2-12 forming an uninterrupted chain, broadening out, round each spiracle upwards, always narrowest at segment margins: sometimes suffused greyish) large patches present, light pinkish-brown in colour, always margined darker, in the spiracular region of segments 2, 8 and 11; on each segment they nearly always are bordered by the front margin and stretch back, including the spiracle as a very general rule, the whole breadth of the segment, encroaching on to the next succeeding segment often to include the spiracle of that, generally narrowest at the segment margins increasing in width towards the segment-middle, reaching rarely at broadest part to more than the dorsolateral region above, never stretching on to ventral region; these patches may all be small, the front one may be wanting (segment 2) and the shape is hardly ever the same in any two larvæ. L: 25 mm: B: 4 mm.



× 2

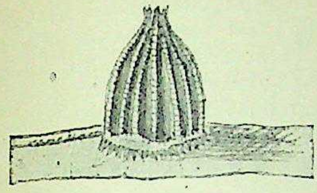
*Pupa*—(*Vide* marginal figure).—The chrysalis is like a large *Colotis amata* pupa in shape and way of hanging. The longitudinal axis of the body is quite straight from the tip of the short, conical snout to the end of segment 13, the cremaster after that being slightly curved under; the thorax is slightly humped and the ventral wing-bulge is quite normally convex; the shoulders are the widest part of pupa and are somewhat suddenly prominent from hinder margin of segment 2; the lateral outline of pupa—the breadth, that is, narrows very slightly behind them gradually to where the body string passes (the pupa is therefore very slightly constricted laterally) and then broadens again gradually to middle where it is nearly as great as at shoulders, thereafter gradually and evenly decreasing again to cremaster; the dorsal outline is straight from behind thorax to end of segment 8, curving gradually thence to cremastral extremity; the ventral line from front of head-point to end of wings, over the bulge, is 14mm of which the straight portion from front to apex of bulge is 10mm; the ventral line of segments 9 to end is gently curved towards longitudinal axis. The head point is a good deal broader at base, which base embraces the whole width and depth of head, than it is high, it is conical with its apex bluntly rounded; segment 2 is in even continuation with the head, (or base of the point rather) is transversely convex, and the front slope of thorax is again in even continuation with it, the dorsal line of head, segment 2 and front slope of thorax being quite straight at an angle of about 35° with the longitudinal axis of pupa; segment 2 hinder and front margins are slightly bent towards each other in dorsal line and its length is somewhat less than the length from end of head-point to the hinder margin of head (front margin of segment 2); the hinder slope of dorsal line of thorax is very gentle and runs imperceptibly into the dorsal plane of abdomen; the hinder margin of thorax is a somewhat gentle curve, the ends of which on each side become nearly a straight line before impinging on wing-line which they do at right angles, the actual angle being an open curve; this hinder margin of thorax has some shallow indentations just in front of it dorsally, a single row; the whole thorax (segment 3) is short; the cremaster is rather long, quite as long as segment 13 and is trapeze-shaped, narrowing backwards, the hinder margin or extremity being very distinctly concave, the lateral margins are thickened and run on to segment 13, the dorsal extensor-ridges are not prominent converging from somewhat flattened extreme hinder corners forwards to front margin where they are well separated, the suspensory hooklets are between them at hinder margin of cremaster and are ventral; the ventral extensor-ridges are more or less parallel, ending each in a little free point; the antennæ, as in all other members of the genus *Colotis*, end, flattened, at the apex of wing-bulge. Spiracles of segment 2 hardly indicated; others oval, colour of pupa, very slightly raised, with a central, depressed line. Surface of pupa is irregularly corrugated, under lens, by impressed lines, pitted also on abdomen, the intersegmental membrane between segments 8, 9 and 9, 10 narrowly exposed; the lateral outline along wing somewhat prominent (the wings are slightly expanded that is) from shoulders to end of wings; the rounded extremity of head-point or snout is smooth. Colour is that of fresh, dry bone, somewhat livid; lateral outline from shoulders to cremaster, above spiracles on segments 8-12, narrowly light, this line on abdomen being brought out by slight, dark shading above it; a black dot laterally near front margin of each segment, sometimes a larger dorsal one near hinder margin of segments 8 and 9; the spot on discocellulars of wings also black; fuscous dots showing at ends of veins of hindwings; shallowly impressed similar dots outside outer margin of antennæ. The pupa is sometimes light green with the lateral line faintly yellow; there is sometimes an indication on head and the succeeding two segments of a dark dorsal line. L: 19 mm; B: 5 mm. at shoulders, the broadest part; H: 6 mm at apex of wing-bulge; B: of abdomen at segment 9: 3·5 mm.

*Habits.*—The eggs are laid separately on the foodplant, generally on an old leaf but sometimes on a dry twig or leaf-scar; if on a leaf, then indiscriminately on the upper or under surface or on the edge; one female was seen to lay 20 eggs in quick succession on a single plant, coming to rest with her wings closed over her back at each operation; the noteworthy feature being the short time she took over each act. This particular female was discovered flying or rather fluttering along over the ground about 11 a.m. in the month of August near Sholapur in the Bombay Presidency; she was followed up for about two hours carefully by two men in grass-land with an open covering of small trees: *Acacia arabica, Capparis divaricata, Mimosa rubricaulis*, Sandalwood, Neem, &c. She kept much to the shade of the trees the tops of which (there were none of them over 25 feet in height) she often explored; often rested on the ground with half-opened wings for ten minutes at a time; until, finally, she found what she wanted: the foodplant of the larva, up to that time unknown. Upon this she immediately commenced laying, and each egg was carefully collected and preserved for breeding purposes. Afterwards, however, a number of larvæ were also found, some of them, a few, full-grown and nearly ready to pupate. Three quarters of them were parasitized and produced ichneumons; three eventually survived to the pupal stage. The males fly fast, generally keep fairly close to the ground, rising occasionally to fly round the foliage of a tree, and keep a more or less straight course which permits of fairly easy capture with a net; they also frequently go to flowers among the grass and rest while drinking the nectar; the females do this too and can also be caught though they are not nearly as commonly seen as the males. The butterfly never seems to be very numerous in individuals where it is found as far as the experience of the writer goes; but at the same time that experience is not very wide, so the statement must be taken for what it is worth. The insect is fond of the sun and open places, indeed it does not exist in jungles at all and certainly avoids the regions of heavy rainfall; it is one of the characteristic butterflies of the plains and desert regions. The males and females often rest upon the ground with the wings closed over the back and the front ones drawn down between the hinder; they will take short flights when disturbed and settle again close by and, when at this game, are easily caught with a net. The larvæ are at first little greenish beasts with the dorsal region lighter, the lateral region speckled closely with brown, the main tubercles well developed with conspicuous hairs and a drop of clear or amber-coloured liquid on the top of each hair; the anal segment has two tubercles with radiating short bristles; the head is orange-brown and has the tubercles and hairs well developed. The full-grown caterpillar is very difficult to spot on the foodplant as the pinkish brown patches along the sides with their narrow, darker bordering and the green of the rest of the body harmonize so well with the colour of the leaves of the foodplant and the brownish scars left on them by the withering of the thin cuticle remaining at the bottom and round the edges of the places where the young larvæ have been feeding; for the small egg-caterpillar eats into the substance of the leaf in irregularly rounded holes of various diameters, always leaving the cuticle at the bottom of the hole thus made untouched; this method of feeding goes on for the first three stages and the little animal may often be found lying at the bottom of the hole; or rather it should be looked for there—it is not easy to find. The mature larva often sits along the edge of the leaf or on a twig or branch or leaf-stalk but is never easy to see; particularly when along a leaf-edge. The foodplant is *Mœrua arenaria*, H. (*Capparidæ*) a climbing shrub, what the ordinary person would call a climber, with ovate leaves, varying much in shape, sometimes narrow, sometimes broad, always with a tiny little point at the end (an *apiculus*), smooth, sometimes softly downy, the old ones thick and fleshy, rather like those of *Salvadora persica* including the light brown marks from wounds by insects, &c.: except that they are opposite; in the *Capparideæ*, they are alternate. The real Capers (genus *Capparis*) are found in all sorts of places, hills and plains, open country and jungles, desert tracts and regions of the heaviest rainfall, whereas

*Mœrua* is confined to places of fairly light rainfall, where the vegetation is comparatively scant and more or less desert localities. Hence the butterfly is also confined to such places; so that *Colotis fausta* and its form *tripuncta* are found in Baluchistan; Sind; the Panjab; Rajputana, extending westward to Afghanistan, Persia, Arabia, Asia Minor and European Turkey; Western and Southern India; the Nilgiris up to 6,000 feet, the Anamalai Hills; Eastern India; Orissa in Bengal, Ganjam; Ceylon. *Fausta* is supposed not to extend south of Bombay; *tripuncta* is supposed not to exist in Sind. This latter however *does* occur in Sind round Karachi and the probabilities are that the two are really one species, notwithstanding that only *tripuncta* has seemingly, always, the white form of the female.

**121. Colotis eucharis**.—Male, *upperside*: pure white. Forewing: base and costa for a short distance generally sparsely irrorated with black scales; a broad, apical, orange-yellow patch with its inner edge straight and margined with gamboge-yellow; this spot is sometimes immaculate but generally bears a black, diffuse spot on its lower, inner edge which may or may not extend to the termen below the orange; costa, apex and termen, the latter nearly up to the tornus, edged and festooned beyond the orange area with black. Hindwing: with black spots at the apices of the veins that vary in size and end on the termen, also a diffuse, preapical, black spot on the costa. *Underside*: pure white in most specimens, suffused, except on the disc of the forewing, with pinkish-yellow and, at base of the same wing, with pure sulphur-yellow; apical, orange patch and terminal, black markings on the upperside of the forewing show through by transparency, the former crossed by a sinuous, fuscous fascia that ends in a diffuse, black spot. Hindwing: shaded with ochraceous at base with a fuscous, preapical spot on costa; also a few scattered, transverse, fuscous striæ and small spots. Many specimens have the preapical, fuscous spot continued as an obscure, fuscous fascia across the wing and bear a series of large, terminal, fuscous spots that correspond to the black spots on the upperside. Both wings with black, discocellular dots. Antennæ, head thorax and abdomen black; antennæ speckled with white on the sides; head and thorax clothed with short, greyish-brown hairs; beneath: palpi, thorax and abdomen white. Female: ground-colour similar, the markings differing from those of the male as follows:—*Upperside*, forewing: base and costa more heavily irrorated with greyish black scales; discocellular spot larger; apical area black, with three enclosed, elongate, orange spots; inner margin of black area irregularly sinuate and diffuse, extended shortly inwards in interspace 3; a transverse, black spot across middle of interspace 1. Hindwing: base irrorated more sparsely than the forewing with greyish-black scales; preapical-costal and terminal spots much larger; in a few specimens there is an obscure, transverse, posterior, discal fascia. *Underside*: markings similar to, but very much broader and more heavily marked and more prominent than, those in the male; the transverse, fuscous striæ and dots more numerous. Antennæ, head, thorax and abdomen as in the male. Expanse 36-50mm.

*Egg.*—The egg is shaped as in the marginal figure which is magnified thirty times. It has 17 longitudinal ribs, some of which coalesce before reaching the top; reaching the top, after coalescing, in a single point or tooth for each ridge thus formed, each composite ridge no broader than either of the original two (or three); the teeth form a tiny crown around



the top of egg; each rib is cross-rayed many times producing a beaded appearance; the intervals between the ribs perhaps slightly broader than them, concave and apparently smooth. In the light the ribs glisten through their entire lengths and are apparently triangular in section. The size of the egg is 0·5mm. in height by not very much less in breadth but the one from which the description was made was slightly broader along the direction of the edge of the leaf on which it had been deposited than in the other direction. Surface slightly shiny, colour orange with subcutaneous dull blotches.

*Larva*—(Pl. 2, fig. 20).—As compared to the larva of *Colotis danæ* just described it is distinguished, apart from the shape and colouring, by the fact that here the body tubercles, that is the subdorsal, dorsolateral ahd supraspiracular (the only one of the spiracular group present here also) being comparatively large and conspicuous; the measurements are as nearly as possible: the tubercles, as broad as high, perhaps very slightly broader at base than at top, are 1/6th of a millimetre, the hair borne by each is ½ a millimetre or three times as long; and the hairs are erect, black and cylindrical, with a spherically thickened tip, bearing a drop of clear or brown liquid. The *head* is nearly exactly similar to that of *sanæ* in the number and shape and colour of the tubercles it bears, but the hair on each is white, not black and there are no smaller subsidiary tubercles; the surface is minutely shiny-frosted, the head is round, has a similar clypeus and false clypeus, has the antennæ, labrum and ligula green, the eyes similar, surrounded by a fine brown line at their bases; the jaws are dark-tipped. The *spiracles* are similarly oval, raised, shiny but are rather dark-brown and those of segments 11, 12 are not, or hardly, larger than the rest. The *surface* of the body is lined transversely like in the other species with 7 lines to each segment, the dorsal region or half-somites are not separated from the ventral by any ledge; besides the usual hair-bearing tubercles, the surface is covered with little white tubercles of the same shape and size as the head, spaced about two tubercle-diameters apart, each one bearing a translucent, white, thick-topped, erect hair; these tubercles are not half the length of the big ones (not 1/12th mm. that is) and the hair is about as long as the tubercle bearing it; except in the spiracular region and down on to the ventrum laterally including the bases of prolegs where the tubercles are sometimes twice as long nearly (not quite) but always thinner than the main ones, and bear white, fine hairs quite as long, in some cases longer, than the main black ones—so that the larva has a fringe of these comparatively long, fine, white hairs all round. There are subdorsal, dorsolateral and supraspiracular tubercles on all segments 2—13, those of segments 3, 4 all in a line along centre of segment, the subdorsal, supraspiracular and an extra lateral one along the front margin of segment 2 (the dorsolateral about centre behind these); all the tubercles are wide apart, that is the subdorsals are widely separated on each segment as well as the dorsolaterals, these latter much wider than the former. The shape is that of *Terias hecabe.* *Colour* of body and head dark green to yellowish green with a light dorsal band generally present, body spotted obscurely darker; in some larvæ there is a large, more or less triangular brown-pinkish white patch including spiracles of segments 6, 7, 8, the anterior one generally the smallest, increasing backwards, the largest never reaching the line of the dorsolateral tubercles, bordered in front by the front margin, never reaching back to more than centre of segment; true legs, belly, prolegs light bluish green; feet lobed (semicircularly) with pinkish booklets. L: 20mm; B: 3·5mm.

*Pupa.*—(Pl., 2, fig. 20*a*).—The shape of the pupa resembles that of *Pareronia* far more than any other; it is not in the least like the other *Colotis* species; it has the ventral wing-bulge extremely accentuated and a long generally upwards-curved, sometimes somewhat twisted, snout to the head. The portion of the body composed of segments 1-4 is thrown back at an angle of about 30° to the rest, the snout counted from the head-frons is as long as the distance from the same place or point backwards to the apex of thorax "hump": it is 3 mm. or slightly more in length and is directed forwards (or down as the pupa generally hangs) in exactly the same straight line as the ventral line of the pupa from segment 1 to apex of wing-bulge opposite segment 7; the snout is longly conical, not always straight throughout its whole length but often curved towards dorsum of pupa, sometimes bent to the side into the margin in its distal part, its basal diameter is less than that of head and the lateral contour of pupa from it to shoulders is a gradually widening triangle; from shoulders back to segment 8 the lateral lines very gently converge towards each other again and there is a slight constriction in the otherwise straight line of the slight lateral wing-expansion at the place where the body-band or suspension-loop passes; the abdomen is more or less circular in transverse section, rather short and stout, gradually thinning to end where it finishes off in a rather broad, trapeze-shaped cremaster which is as broad as long for the last half of its length, is convex transversely over dorsum, has thickened lateral margins, two dorsal ridges from the hinder lateral corners converging forwards to nearly meet in dorsal line at front margin and two ventral extensor ridges ending each in a minute, free, sharp tooth anteriorly. Segment 2 is as long as half thorax-length and has its two margins (front and hinder) curved considerable towards each other in dorsal region (where it is thus narrowest) it is convex transversely and its dorsal plane inclines gradually away from longitudinal axis of pupa towards thorax; the thorax is not very prominently humped, the apex of the hump (which hump is evenly rounded) is just behind the middle of its length, hinder margin is a gentle curve meeting the wing-line in an angle of 90° open and sharp. The *spiracle* of segment 2 is just a linear indication which is quite straight and has a very slight white, narrow, raised surface behind it on the front margin of segment 3; other spiracles are nearly white, oval, perhaps rather large, flush. The *surface* of the pupa is rather coarsely shallow-pitted, irregularly impressed-lined and tuberculate-corrugated (of course very shallowly and only visible under lens) on the wings and segments 1-3; the antennæ (which by the way in these pupæ reach only to apex of wing-bulge) are serrated along their edge (characteristic of this species) with little sharp teeth; the snout is very tuberculate-rugose. The *colour* is glaucous green with a yellow shade, the lateral wing-line from shoulders, continued along abdomen to cremaster, yellow-whitish, the whole surface vermiculated with little short, whitish lines or marblings; a black spot on discocellulars of wing, a few faint ones towards middle of inside margin of antennæ; and there may be a lateral black dot on each segment dorsally as well as a dorsal line at hinder margins of segments 8, 9. The colour may be darker green; then the wing-margin is yellow; the colour may be light yellowish brown marbled and blotched with white and darker brown. L: 17 mm; B: 4 mm; H at apex of wing-bulge: 6 mm. nearly.

*Habits.*—The eggs are laid single, often on a dead thorn or stick; the larvæ live generally on the underside of the leaves; though sometimes in the middle of upperside, sit sometimes with the front segments very much in the air, occasionally with the tail end also raised. They are sluggish and drop, curling up, when disturbed.

They turn pink before pupation; and are very subject to parasites, ichneumons and flies being the usual enemies, especially the former; out of every 10 larvæ found, at least six or even more die from this cause. The pupa is attached very firmly by the tail to the underside of a leaf or the stalk, or stem of the plant, or a dead twig amongst the rubbish that generally surrounds the bushes of *Cadaba indica*, the commonest foodplant. The butterfly emerges in about a week. It is a somewhat weak flier and hardly ever rises far from the ground, is generally found in numbers near or around the foodplant, of the flowers of which it is very fond and it is most active in bright sunshine in the middle of the day when it is quite difficult to catch; it comes easily, however, to a decoy placed on the ground, though only males can be thus caught. The female is not often seen somehow, probably it attends strictly to business and keeps to the thickets. The insect rests with its wings closed though not drawn in between each other at all, very frequently on the ground, less often on the undersides of leaves, twigs, &c. In rainy weather it is possible to catch it in the fingers when thus resting as it becomes more or less stupid in the absence of the dry, hot sunshine. Its distribution is "Central and Southern India from Bombay to Travancore; Ceylon." It is not found in the jungles at all as it is a Plain Country species. It is nearly always met with in company of *Colotis etrida* and *C. danæ*, as the foodplants are the same for the larvæ of all three. These foodplants are all of the Caper family and this species has been bred nearly always from caterpillars found on *Cadaba indica*, a scandent shrub common in waste places and hedges in the Deccan with generally oval, thickish, small, dark green, smooth (except when young when they are lighter, longer and somewhat mealy) leaves, white flowers with a curious pinkish claw and long stamens and a long round pod bursting and curling lengthways to expose the bright red inner part.

A few days before writing this, numbers of the butterfly were noticed at Bandra on the sea coast north of Bombay in the Thana District; they were flying round a single bush of *Cadaba* which happened to be growing in a hedge round a house on Bandra Hill.

**122. Colotis etrida.**—(Pl. J. Figs. 67 ♂, 67a ♀.).—Male, *upperside*: white, sparsely irrorated at base of fore and hindwings with black scales. Forewing: a small, black spot on the discocellulars; apex broadly black, with an enclosed, oval, curved, rich orange patch placed obliquely and traversed by the veins which there are black; inner edge of black area diffuse. Hindwing uniform except for a preapical, short diffuse, black streak from costa, sometimes absent and a series of terminal, black spots that, in specimens from moist localities, are very large. *Underside*: white, cell and apex of forewing suffused with sulphur-yellow, the orange patch of the upperside shows through by transparency, its inner edge margined anteriorly by a very oblique, obscure, fuscous fascia. Hindwing: the preapical, short, transverse, black streak on the upperside obscurely indicated. Female very similar to the male but can be distinguished as follows :—*upperside*: forewing: orange patch enclosed within the black, apical area narrower ; a small, black spot in the middle of interspace 1 and another in interspace 3 (there may be an indication of one in interspace 2 also). Hindwing: the terminal spots slightly larger. *Underside*: apex of fore and whole surface of hindwing suffused lightly or, in specimens from very dry localities, heavily with ochraceous. Forewing: spots in interspaces 1 and 3 as on upperside. Hindwing: a curved, almost complete, discal series of fuscous spots; otherwise as in the male. In both sexes the antennæ vary from white to pale brownish; head, thorax and abdomen black, the head and thorax with short, greyish-brown hairs; beneath: the palpi, thorax and abdomen white. Expanse 30-44 mm.

*Egg.*—Longer than broad, cylindrical for its basal $\frac{2}{3}$rds, the apical third conical, somewhat narrowly truncated; there are 8 longitudinal ridges which are well defined, rounded in section, transversely finely striated running from base to apex; the concave intervals also finely striated cross-ways, except in the very centre, narrowly; the ridges all end abruptly round the apex showing little sign of teeth. Surface shiny. Colour when laid yellowish changing later on to reddish caused by profuse blotching. L: 1 mm.; B: 0·5 mm.

*Larva.*—The larva is like that of *Terias hecabe* in facies but has the anal segment shortly but obscurely bifid-knobbed, the hinder margin of the flap being distinctly indented and the dorsum depressed between the knobs; body cylindrical, narrowing in anal segments and, slightly, in 2 and 1, the colouration is also different. Segment 2 is slightly broader than the head. The head is roundish, the clypeus large and curvilinear-triangular; the surface is covered with minute, light-coloured tubercles, each bearing a short, stiff, dark hair; the colour is glaucous green, the eyes are brown, the labrum watery green, the antennæ green. The surface of the body is slightly shiny, rather coarsely transversely and paralleledly lined and set all over with minute tubercles, each tubercle bearing an erect, short, black or dark hair; among these are the usual subdorsal, dorsolateral supraspiracular (slightly behind the spiracle) and subspiracular tubercles, slightly larger than the rest and bearing, each, a longer hair from the point of which exudes, sometimes, a drop of clear liquid; all the tubercles are greenish bluish-white in colour. The spiracles are small, slightly prominent, oval shining, light, watery, green; on the band. The colour of the larva with a broad, white, spiracular band touched with orange above each spiracle and bordered below by a slightly less broad, purplish-chocolate band, both bands reaching the whole length of the body; ventrum green; legs and proleg green. L: 19mm.; B: 3mm.

*Pupa.*—The pupa is also of the type of that of *Terias hecabe*. It has a slightly turned up snout and a distinctly bifid cremastral extremity: the points being very bluntly rounded with a considerable depression between them. There is a slight lateral constriction behind the thorax. The body surface is somewhat granular on the wings, smooth elsewhere though slightly aciculate-lined under the lens. The spiracles of segment 2 are indicated by a longly oval surface facing somewhat backwards, formed by the raising of the hinder margin of segment 2; the other spiracles are oval, slightly raised, of the usual size, and are white in colour. The colour of the pupa is a pinkish bone-colour with a strongly green-sepia band above the spiracular line from segment 6/7 to segment 13; a similarly coloured dorsal band from head to same segment; the abdomen is streaked with three similar, light-coloured bands on each side longitudinally, these bands interrupted narrowly at the segment margins; the wings have the veins thinly white with a green-sepia splash down the middle of each wing; the dorsum is, besides marked with green-sepia, there being a blotch on each segment just above the supraspiracular band with a minute, black spot beneath : this spot is larger on segment 5 than elsewhere ; a whitish band along the dorsal margin of wing from shoulder to segment 7. This pupa was formed under glass ; formed among leaves it has a more or less strongly green colouration. L : 18 mm ; B. 3·5 mm. at shoulders which is the broadest point ; the height at apex of wingbulge is 4·5 mm.

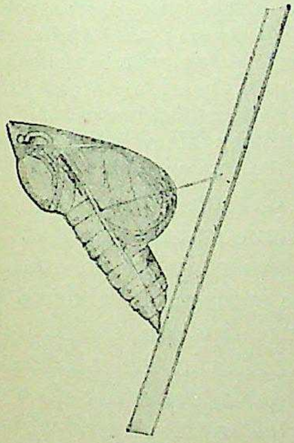
*Habits.*—The eggs are laid singly on the young shoots, on a flower bud or on the upper or underside of a leaf, on a withered stem, twig or stalk, in fact anywhere. The larvæ feed upon the young parts generally. They rest in the centre of the upperside of a leaf, along the midrib as usual, on a bed of silk ; and will fall to the ground, curled up, when alarmed. The pupation takes place as usual but nearly always on a leaf close to the ground, on the underside, so that the chrysalis is exposed to the soil or a dead leaf or other light object which probably accounts for the majority of those found being bone-coloured instead of green. The ways of the butterfly are more akin to those of *C. danæ* than to any of the others; it is fairly strong on the wing and rises often a good distance from the ground and will face open spaces with unconcern. Otherwise there is nothing particular about its ways to call for remark ; it may be found most plentifully about the foodplants like the others. The caterpillar feeds upon Capers and it has been bred most commonly upon *Cadaba indica*, Lmk. It, however, eats *Capparis aphylla*, Roth. quite readily and probably various other members of the *Capparideæ*. *Colotis etrida* is distributed throughout India with the exception of Bengal ; also in Baluchistan and Kashmir. It is not found in jungles.

There is a race, *limbata*, Butler, found in Ceylon which is hardly separable from typical *etrida*.

**121. Colotis danæ.**—Male and female : colouration very variable, especially in the female.—Male, *upperside* white, base of wings generally irrorated, but to a varying extent, with black scales. This irroration in many specimens is entirely wanting. Forewing, with or without a minute, black speck on the discocellulars ; apex broadly carmine, edged internally and externally with black, this black border varies in width, but both inner and outer borders meet on the costa and on the termen ; on the latter they unite and sometimes extend as a black line to the tornus. Hindwing : uniform except for a series of black, terminal spots which, in some specimens, are comparatively large and connected together by a slender, anteciliary, black line, in others, minute more or less obsolescent, unconnected dots. *Underside* white. Forewing : base of cell washed with sulphur-yellow ; spot on discocellulars as on upperside : apical, carmine area of the upperside represented by an ochraceous-pink patch, not margined with black, but similar in shape and position ; in some specimens this is more or less suffused with greyish scales ; in all it is crossed near its inner edge by an obliquely-placed series of four or five spots that vary in colour from pale carmine-ferruginous to black. In some specimens there are two terminal, diffuse, black spots, one each at the ends of veins 2 and 3. Hindwing : the ground-colour lightly, often heavily suffused with ochraceous-pink ; sometimes pure white ; a small spot on the discocellulars pale ferruginous to black, sometimes annular and centred with carmine, followed by a curved macular, discal band that also varies in colour from pale ferruginous to black and has the posterior spots often obsolescent or even completely absent; a series of minute, black dots at the vein ends that runs to the termen and may or may not be connected by a slender, anteciliary, black line. Antennæ pale-brown speckled with white; head, thorax and abdomen black; head and thorax anteriorly clothed with brown, sometimes greyish-black hairs; beneath: palpi, thorax and abdomen white. Female *upperside* white, base of wings lightly, often heavily, irrorated with greyish-black scales. In some specimens the irroration is very scanty, in others it occupies fully a third of the wings from base and extends as a broad band parallel to dorsum on the hindwing. Forewing: an apical, carmine patch as in the male but smaller, sometimes reduced to a mere row of preapical, pale-rosy streaks, but always bordered externally, and generally internally also, by black of varying width. In some specimens the inner-black border is very narrow, in others broad and in a few, entirely absent. The outer border, again, in some specimens, is inwardly festooned and may be either broad or comparatively narrow. Discocellular spot as in the male but larger, followed by an anterior, postdiscal, macular, curved, black band, the upper spots of which cross the carmine area or, when the carmine area is reduced to short streaks, the band crosses the black, internal edging to it, showing up in a darker tint than the edging itself; lastly, a black, transverse, somewhat diffuse spot in interspaces 1 and 2. Hindwing: with a dusky spot on the discocellulars; a black, macular, discal, curved, more or less incomplete band, and a terminal row of black spots that in some specimens are connected to form a continuous band. All these markings are generally diffuse. *Underside*, forewing: white, suffused with sulphur-yellow at base of cell and with ochraceous (in some specimens ochraceous-grey, in others ochraceous-red) on apical area; spot on discocellulars, the postdiscal, macular band and spots in interspaces 1 and 2 as on the upperside, but more clearly defined, the spots that compose the postdiscal band sometimes annular. Hindwing: white, suffused to a greater or less degree with ochraceous, sometimes pink spot on discocellulars and discal, macular band as on the upperside; but both the discocellular spot and the spots that compose the latter more clearly defined, annular and generally centred with carmine; a terminal row of black specks which may or may not be connected with a very slender, anteciliary line. Antennæ, head, thorax and abdomen above and below as in the male. Expanse 40-52mm.

*Larva.*—The larva is somewhat like a small *Hebomoia* in that the dorso-ventral line is somewhat flanged; that is, the otherwise even curves of the transverse section is slightly prominent-angled there; the colouring is also, somewhat like that of *H. glaucippe*; the 12th segment is however here slightly swollen dorsally and laterally, though evenly. The *head* is about the same diameter as segment 2; its vertex is sometimes, when the larva is at rest, slightly covered by the straight front margin of that segment; the shape is round, the clypeus is large and triangular, longer than broad and about half the length of the height of the head; the false clypeus appears over its apex as an arch; the surface of the head is set with many minute, lowly cylindrical, white tubercles, the intervals between them amounting to about two or three tubercle-diameters, each tubercle bearing a short, stiff, black hair directed downwards, each hair being not quite twice the length of the tubercle from which it springs; there are still smaller, similar tubercles, difficult to see because of their minute size, in the intervals; the colour of the head is green, the eyes are white-glassy, sometimes touched with brown, arranged 5 in a gentle curve, the 6th inside it and opposite the middle one; the labrum and ligula are shiny green; the antennal second joint suffused-brownish, the basal joint green; the jaws are tipped dark. The *surface* of the larva is tranversely 7-lined on each segment, the lines being parallel, thin-depressed; the usual tubercles are present, white, of the same size as those of the head and of the same shape, each bearing an erect, black hair about twice their own length; the dorsolateral ones rather far apart on each segment, the supraspiracular one being the only one of the spiracular group that is traceable; besides these tubercles the body is covered with many, still more minute, similar tubercles bearing, each one, a tiny, black, erect hair; on the belly, where the tubercles also exist, the hairs are white; each of the larger tubercle-hairs—the subdorsal, dorsolateral and supraspiracular ones that is—bears at each point a globular drop of clear fluid. The *colour* is generally glaucous green with many indistinct whitish spots or short lines, one on each side of each minute tubercle or hair, the length of the line being limited by the breadth of the transverse ridge along which these hairs are arranged; there is a white spiracular broad line, on which the spiracles are situated, from the head to the end of anal flap and along its hinder margin which may be bordered above by plum-colour or brown-orange; the true legs and prolegs are glaucous green, the feet lobed (semicircular) with brown hooklets. The *anal flap* is trapeze-shaped in outline, the hinder margin not very much shorter than the anterior margin, the lateral margins perhaps longest, the dorsal surface very slightly sloping towards the longitudinal axis of larva, the posterior margin very gently concave between its extremities, slightly thickened. *Spiracles* rather large perhaps, shiny-greyish with very thin brown margins, rather broadly oval, slightly raised: those of the segment 2, segment 12 and, curiously enough, also segment 11 larger than the rest. L: up to 20mm.; B: 3·5mm.

*Pupa*—(*vide* fig. in margin)—The pupa of this species is stout, with a short, thickly conical snout or head-cone—it can hardly here be called a snout— which is not as broad at base as the pupa at eyes; it has a prominent ventral wing-bulge of which the length from top of snout (quite straight) to its apex is 11mm, the length from apex to where it ends at segment-margin 8/9 is 4mm, the height from apex to dorsum of pupa is 6·5mm; the thorax is moderately humped and the line of dorsum of abdomen, if continued through the anterior segments forwards, would pass through the shoulders and out through the eyes, so that the part of pupa embracing segments 1-4 is slightly inclined up (dorsal) to the abdominal part; the snout is 1mm long by the same breadth at base; in fact, an equilateral triangle or cone; the breadth of the pupa at eyes where it suddenly widens from base of snout is 2·5mm whence backwards it increases very little in breadth for the short distance to shoulders where, suddenly, the breadth becomes 4·5 mm, gently decreasing backwards to the very slight constriction where the body-loop passes over the posterior portion of segment 5; thence to cremaster the lateral outline converges gently at first, then more rapidly, to end in the trapeze-shaped, laterally thick-margined, cremastral piece with a moderately gently concave posterior margin, and subdorsal ridges starting from the hinder corners, converging forwards, but separated considerably at the front margin; the ventral surface shows little of the extensor ridges except their minutely free, blunt extremities forward. The head vertex shows as a narrow band behind the snout; segment 3 as a broader piece with curved front margin (concavity forward), and both head-vertex and major part of segment 2 have their dorsal line parallel to pupal



longitudinal axis: the hinder portion of segment 2 being included in the front slope of thoracic hump, its hinder margin is straight in the dorsal region; the front slope of thorax is at about 30° to longitudinal axis, ascends to about 2/3 its thoracic length, then, the change being an even curve, descends to front margin of segment 5, segment 4 being included in the posterior slope, which is about the same as the anterior; the hinder margin of thorax is a gentle curve meeting the wing-line in an open, broadly-curved angle of somewhat less than 90°; segments 4 and 5 are about the same length, the latter being in the abdominal dorsal straight line; the segment margins are fairly plainly defined. The *spiracles* of segment 2 are indicated by a longly oval, smooth surface facing slightly forward, formed by the raising of the front margin of segment 3, and is light green; the others are oval, perhaps rather large, more or less flush, whitish. The surface of pupa is slightly shiny, somewhat marbled-rugose, slightly tuberculate on thorax, though, even under lens, there are really no prominent parts except a few small tubercles about shoulders; the head-cone is quite smooth. *Colour* is green or bone-coloured, according to circumstances; when the former the marbling-rugoseness is produced by many irregularly disposed lines and dots which appear greenish under lens; the spot on discocellulars smooth, unlined, conspicuous; indication of a greenish, dorsal, broad line and black, supraspiracular dot to each segment; lateral outline-edge from shoulders to abdomen, continued as a spiracular line, vaguely yellow; cremastral hooklets rusty pinkish; two parallel brownish (whitish in green pupa) fasciæ diagonally across wing from middle of costal margin to just before tornus for one, the other parallel, just behind and touching the discocellular spot. When the pupa is green there is sometimes no sign of these transverse fasciæ, the whole surface is uniformly of one colour, a rather whitish-green, or, perhaps, a trifle glaucous in shade, with the discocellular spot on the wing; sometimes the prominent part of shoulder may be light pinkish-brown; the abdomen marked on segments 9, 10 with a small pinkish-brown patch, which includes the spiracle, and sometimes with a yellowish spiracular band or broad line which starts from the shoulder and runs backwards to meet this patch. L: 15 to 16mm; B: 4·5mm at shoulders, slightly less in middle; H: at wing-bulge: 6·5 mm; at segment 9 immediately after it: about 4·5 mm or somewhat less.

*Habits.*—The egg is laid, never more than one at a time, on an old leaf or its stalk, or sometimes on a convenient dead bit of stuff near by. The little larva when it emerges, is generally found on the underside of an old leaf of which it eats the epidermis, though it will also eat young leaves—there are often very few on the plant. As the caterpillar becomes bigger it sometimes lies in the middle of a leaf, like any other pierine larva, though it is generally found feeding stretched along the edge; it does not fall to the ground when disturbed quite as readily as that of *C. etrida* or *eucharis*. It turns pink before changing to the pupa. The pupation takes place from the underside of an old leaf near the ground as a rule, or from a stalk or twig, often the loose body-band breaks and it depends from the tail-fixing only which however is so strong that the pupa stands straight out from the surface even when that surface is perpendicular, though the favourite position is from a horizontal surface. The growth of the larva is rapid, the duration of the pupal stage about a week; the butterfly emerges generally in the early morning and flies as soon as ever the sun shows though it is most active in the hottest hours of the morning, say about midday and from 12 to 2. It flies straighter than the other members of the genus except the male of *C. fausta*; it is really rather a powerful little insect. It rarely rises any distance from the ground however, though it will face large open spaces away from bushes much more readily that *C. amata, etrida* or *eucharis*. It is never found in the jungles and regions of heavy rainfall; it is plentiful in countries like Sind for example. The larvæ are, in common with all others of the genus, very much parasitised by ichneumons, the pupa by flies; a large percentage dying from these causes. Males and females in the butterfly stage are nearly equally plentiful where it occurs like *C. amata* and unlike *C. etrida, eucharis* and *fausta*, of which, generally speaking, the females are comparatively scarce. The foodplants of the larva all belong to the Caper family; it has been bred on *Cadaba indica, Capparis sepiaria* and *divaricata*; and will, no doubt, feed upon any other; also on *Mærua arenaria.* The insect is found in Baluchistan, Sind, Western India, Southern India and Ceylon.

Upon a general survey of the species of *Ixias, Colotis* and *Hebomoia* caterpillars and pupæ, there seems little doubt that the first two genera have much in common and are very closely related—a fact that, besides, seems evident from the general appearance and colouration in the imagines. The pupæ of *Ixias* and *Colotis eucharis* are very like each other. *Colotis danæ* and *Hebonoia glaucippe* larvæ also somewhat resemble each other but, perhaps, hardly sufficiently to indicate as close a relationship as between *Ixias* and *Colotis* generally.

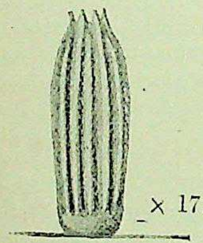
### Genus—HEBOMOIA.

**124. Hebomoia glaucippe.**—(Pl. J. figs. 66 ♂, 66*a* ♀).—*West-season brood.*—Male, *upperside*: creamy white. Forewing: the costal margin narrowly, the apex and terminal margin to middle of interspace 1, black; an irregular, somewhat sinuous, black band extends obliquely from beyond the middle of costa across the upper apex of the cell and meets, at interspace 1, the black on the terminal margin; within the triangle thus formed is enclosed a rich, orange-red patch that is crossed by the black veins and bears, in interspaces 3 to 6, a postdiscal series of black, inwardly-elongated spots. Hindwing: nearly uniform, touched with black on the terminal margin anteriorly and with a conspicuous, postdiscal black spot in interspace 7; in some specimens one or two smaller spots in continuation of the series in the interspaces below. *Underside*: white; apical third of the forewing and the whole of the hindwing mottled with more or less prominent, brown strigæ and spots; costa of the forewing and a fine line that runs from the base of the hindwing through the cell, straight to the middle of the terminal margin, brown. Antennæ dark brown; head and thorax anteriorly with reddish-brown pile; thorax above greyish-blue, abdomen white with a bluish tinge; beneath: head and thorax more or less brownish, abdomen white. Female: similar to the male. *Upperside*: ground-colour with a slight greenish tinge; the orange patch on forewing more restricted: it consists of a series of broad streaks in interspaces 3 to 6 and 10, the outer apices of which are deeply incised by black, and with a row of hastate, orange spots beyond in interspaces 2 to 6. Hindwing: similar to the hindwing in the male, but with a postdiscal series of large, triangular, black spots and a terminal, connected series of still larger ones at the apices of veins 2 to 7. *Underside*: similar to that in the male, the brown, transverse strigæ and spots are more numerous, the costa of the forewing and the median line on the hindwing very prominently brown. Antennæ, head, thorax and abdomen as in male.

*Dry-season brood.*—Male and female differ only from the wet-season brood in the slightly more falcate apex to the forewing and in the purer, white ground-colour on the upperside; also the terminal margin of the hindwing in the male has the black markings all but obsolete, while in the female the postdiscal and terminal black markings on the same are smaller than in the wet-season form. *Underside*: the mottlings of brown strigæ and minute spots more numerous and dense. Expanse: 94-100 mm.

There is a race: *australis*, Butler, said to replace *glaucippe* in "Southern India from the Ghauts at Khandalla, south-eastwards to Ceylon" which is distinguished from the typical form, in that the male and female have the inner, black border to the orange patch on the upperside absent; this represented by a few obsolete touches of black scaling. Hindwing: white throughout with only a half-obliterated, subcostal, black spot in interspace 7 in the male; in the female, the postdiscal and terminal series of spots smaller.

In the Kanara district of the Bombay Presidency, however, it is a fact that *H. glaucippe* exists and that forms intermediate between it and *australis* are also found. There is little doubt that the latter is not even a constant *form*.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*Egg.*—(*v.* marginal figure).—This is three times as high as broad, narrowest at base, gradually increasing in diameter upwards to about ⅔ the total height, then suddenly narrowing in a curve to apex which is again suddenly narrowed into a low, circular ring of teeth round the micropile. There are 11 or 12 longitudinal ridges which are thin and low, the intervals between each two about equal to the breadth of a ridge, each alternate one reaching the apex of the egg as one of the above sharp teeth, the others disappearing in the surface before the absolute top; colour shiny white when laid, with a pink shade; turning yellow later on.

*Larva.* (Pl. I, fig. 19).—The body is somewhat fish-shaped, having the dorsal half-segments convex, the ventral flattened; segments 2-4 are somewhat depressed and segments 3-4 are laterally broadened out; the anal segment is narrowed, somewhat considerably flattened-depressed, ending square with a slight indentation in centre of extreme margin and it overhangs the anal claspers behind. The body is broadest by far at segment 3. Head much flattened on face, more or less parallel-sided, rounded over vertex and at base; surface covered with transparent, conical, bluish tubercles, each bearing a fine, short seta, margined laterally by a whitish-yellow band in continuation of the subspiracular band of body; it is small for the size of the caterpillar and there is very little neck, the front margin of segment 2 embracing it completely at the back; colour glaucous green. Surface of body conspicuously crossed by 7 parallel, depressed lines on most segments (less on the anterior segments, none on anal segment); the interval between each two of these impressed transverse lines bears a single row of small, cylindrical, translucent, pointed, blue tubercles, each bearing a fine, short, brown seta; there are, besides many smaller, conical tubercles; the tubercles along the subspiracular line on segments 3 and 4 are swollen, resembling beads, adding thus to the tumid, lateral appearance of those segments; the ventrum is smooth. Spiracles small, oval, yellow, situated above the beaded line and touching it. Colour of body is glaucous-green, lightest in the spiracular region, with a beaded, white, subspiracular line running from hinder margin of segment 13 to the head where it ends at the base of the jaws; the lower half of the leads on this subspiracular line is orange, except on segment 3 where it is blue; through each one of the transverse tubercles (each row of such reaching down to spiracular line on each side) runs a short, longitudinal, purple line, limited at each end by the impressed, transverse lines between which the tubercle stands, this purplish line splitting to let the tubercle in; ventrum and legs, also prolegs, watery green. L: 47 mm; B at segment 3: nearly 8 mm; B of head: 3 mm; the height is greatest at segment 3.

*Pupa*—(Pl. I, fig. 19*a*.)—The shape is that of *Catopsilia*. The thorax is inclined at a very wide angle to that of abdomen in the dorsal line; ventrally the wing-bulge is not specially great, the anterior side of it (in the ventral, central line) is at right angles to the posterior side, the two joining each other in a curve; the head-snout is conical) at its base, cylindrical in its upper portion, slightly turned up at the point, with a very rugose surface. Wing cases slightly expanded laterally along dorsal wing-margin, diverging slightly one from the other from shoulders backwards so that the pupa is broader at middle than at shoulders; dorsal constriction behind thorax slight, laterally also; shoulders prominent, the pupa being much broader there than at segment 2. Cremaster longly triangular, strong, distinctly bifid at extremity; the extensor-ridges rugose, strong and ventral. Surface glabrous, very finely, transversely rugose under a magnifying glass, the impressed lines irregular. Spiracles of segment 2 hardly indicated; the rest longly oval, somewhat raised, yellow in colour. Colour of the pupa is dark yellowish-green; back purple as well as a lateral band on head, a large dorsal spot on segments 4, 5, 9; the dorsal margin of wings from the shoulders to segment 7 light brown; surface of wings mottled sparsely brown-purple; eyes with a semicircular, black, anterior margin. L: 37·5 mm B: 9·4 mm at shoulders; H at wing-bulge: 12·5 mm.

*Habits.*—The egg is laid, always singly, on the upperside of a leaf, an old leaf being generally preferred and one close to the ground mostly. The little larva betakes itself at once, after eating the egg-shell, to the base of the leaf where it lies along the midrib with its head towards the point, covering the part where it lies with a good carpet of shining white silk; this bed it enlarges as it grows and often sticks to the same leaf for several stages of its growth. It never eats the bed-leaf but wanders off to the tips of branches in search of its food where it can get tender leaves to eat; it eats mostly in the evenings and mornings and probably at night-time, lying quiet during the day-time and often well hidden in amongst the foliage near the base of the plant. Once the larva is full grown it is not difficult to find as it is so big; there are often two or three on a single plant but as this may be extremely extensive, it is often not easy to find them. The pupation generally takes place on one of the leaves of the foodplant and the chrysalis is always strung from the underside of a leaf well hidden near the ground or close to the stem. The method of suspension is the same as that of *Catopsilia* with a strong tail-fixing and a moderately close body-loop. The larva is not a particularly fast grower. Its position on a leaf is generally, with the fore part raised in the air, the front legs bunched and the front segments made as broad as possible; sometimes the anal claspers are also held free from the sitting surface. The butterfly is the strongest and most powerful flier amongst all the *Pieridæ*; it is also the largest. It often rests on the ground, goes to damp places in nallas and on roads in the hot months of the year; comes freely to flowers and may always be seen, wherever it exists, where the foodplants are; it is fond of the sun and has the habit of keeping to the same "beat" for a long time, returning over the same ground again and again. The flight is rapid, consisting of strong up-and-down beats of the wings which are hardly ever completely brought together over the back between the strokes, the course in a perpendicular plane would be a series of segments of a circle, the more or less convexity depending upon the pace at the time; often the wings are held half closed over the back for quite a considerable interval when descending and this style of flight is mostly assumed when there is more than one insect around and they are playing. The position of rest is with the wings closed over the back, the fore wings brought right down between the hind ones so that only the dark apical part of the former, harmonizing with the dark undersides of the latter, remains visible; when pitched on the ground among leaves or rubbish the insect is, in this position, quite invisible, the colour and pattern blends so well with the surroundings. The foodplants belong to the *Capparideæ* and the larva has been found on *Cratæva religiosa* very commonly; also, equally often, upon the large climber *Capparis Moonii*. *Glaucippe* is not exactly a butterfly of the Plains but will be found anywhere in the hills where there is forest and around them on the borders of the open country from sea-level upwards; it is plentiful in regions of heavy rainfall. Its distribution is given as N. E. India, Nepal; Sikkim, Bhutan, Assam; Burma and Tenasserim to the Malay Peninsula, and eastwards through the Shan States in Upper Burma to Siam and China. It would not be wrong, perhaps, to say that it exists throughout India from the Himalayas to Cape Comorin and in Ceylon, &c., wherever there are hills and forests and sufficient moisture.

The genus *Hebomoia* is Indo-Malayan in distribution. There is one other species in British India, namely *H. ræpstorfi*, Wood-Mason, from the South Andamans and Barren Island which is differentiated by the wings being suffused with pure sulphur-yellow.

### Genus—PARERONIA.

The genus is Indo-Malayan and consists of four recognized species of which two only interest us. The other two are *P. avatar* from Tenasserim, the other *P. ceylanica* from Ceylon (said to occur also in S. India: in the Nilgiris, Cochin and Travancore); the former with the veins not defined with black on the upperside: a very pale blue all over inside the black, terminal bordering. *Ceylanica* is probably not a good species but only a variety of *pingasa*.

**125. Pareronia hippia.**—(Pl. I, figs. 63 ♂, 63a ♀.)—Male, *upperside* : a clear somewhat pale blue ; all the veins defined with black; forewing : costal broadly apex and terminal margin very broadly black, this black ; on the termen narrowed towards tornus and traversed by a transverse, subterminal series of bluish-white spots that are variable in number ; the spot in interspace 3 shifted inwards ; sometimes the posterior two spots of the series are all but joined on to the streaks of the ground-colour between the veins. Hindwing : dorsal and costal margins broadly whitish, terminal margin broadly black, especially at the apex the black area covered except at the tornus, with specialized, opaque-looking scales. *Underside* : paler blue, the terminal margins of the wings obscurely fuscous, traversed by a subterminal, very indistinct, transverse series of whitish lunulate spots. Forewing : veins more or less broadly bordered with black, this edging dilated towards the termen ; apex broadly, terminal margin decreasingly to the tornus, suffused with a somewhat obscure, pearly-white lustre. Hindwing : the subcostal vein and veins 6, 7 and 8 broadly, the rest of the veins very narrowly edged with black ; a very fine, black line in interspace 1. Cilia of both wings very narrow, white. Antennæ black ; head, thorax and abdomen fuscous, the thorax clothed with long, bluish hairs ; beneath : the palpi, thorax and abdomen pale, silvery bluish-white.

Female, 1*st Form, upperside* : black, the markings bluish white ; forewing : cell with two streaks, the anterior one from extreme base, the posterior one from end of basal third but extending beyond the anterior streak ; below and beyond the cell : a series of streaks in the interspaces ; the streaks very irregular in length, that in interspace 1 the longest, angulated anteriorly and divided longitudinally from near the base, the streak in interspace 3 short and broad, forming an elongate spot, those in the anterior interspaces more or less obliquely placed ; beyond these streaks follows a subterminal, transverse series of spots of which the spot in interspace 3 is shifted inwards and those opposite the apex curved backwards. Hindwing : costa and dorsum broadly white ; cell and the interspaces beyond with a series of streaks and subterminal spots more or less as in the forewing but more regular, the streak in cell and interspace 1 divided longitudinally, the subterminal series of spots evenly curved. *Underside* : similar to the upperside, but the ground-colour dull, dusky and diffuse, the markings broader but less clearly defined ; the apical area on the forewing obscured by a powdering of whitish scales. Antennæ, head, thorax and abdomen much as in the male, but darker ; eyes bright green when alive.

2*nd Form.*—Very like the first, the markings of both sides similar, but the ground-colour on the upperside of the hindwing at base in interspace 1a, over the whole of interspace 1, area of cell and at base of interspace 2 suffused with bright yellow. On the underside the same areas are dull ochraceous. The extent of the bright yellow colour on the upperside and the dull ochraceous tint on the underside is variable, in some specimens more restricted, in others it spreads further towards the costa. This form does not appear until the end of the rains ; in a brood of, say, fifteen, of which 7 are females, 1 or 2 may occur with these yellow markings. Expanse 70-80mm.

*Egg.*—In shape a pointed oval, narrowly truncated at apex, a little less so, perhaps, at base, the apex crowned in a small circle with 8, sometimes 7, pointed, little teeth ; the interior of this circle is flat ; the teeth are the end of longitudinal ridges which start at the base of the eggs ; there are 17 of tehse ridges but about half of them, from 8 to 9 that is, join others and loose themselves in them near the top of egg and, therefore, never reach the crown ; these ribs are minutely beaded, a single row of beads, throughout their lengths and the intervals separating them from each other are about double as broad as they are themselves. The surface of the egg is shiny and the bottoms of the intervals are quite smooth, not cross-rayed. The colour is whitish when first layed, later with four, faded-rose coloured bands, parallel to each other, the first just below the apex, the fourth at a distance of 1/4 the height of egg from base. H : nearly 2mm.; B : 0·6mm.

*Larva.*—The larva is very similar to that of *P. pingasa* described below, the points of anal segment perhaps slightly less developed, the brown patches on the spiracular area of segments 5 and 12 in that species wanting here ; on the whole the larva is less marked than in that species. The 1st stage, immediately after it emerges from the egg is as follows :—Shape subcylindrical, thickest in the middle ; thinning slightly to both ends ; the anal segment square, dorsally flattened, with a conical, fleshy, finely-haired process or point from each hinder angle of flap (extremity of larva), these points being divergent and directed horizontally backwards. Head about the same breadth as segment 2, round in shape, with a triangular clypeus of ordinary size ; surface shiny, covered with some 40 longish, white, erect hairs; jaws and area about eyes reddish-brown ; colour of head green. Surface of body surface shiny, with three impressed, transverse, parallel lines to each segment ; each segment with the usual tubercles, one subdorsal, one dorsolateral, one supra-and one subspiracular, rather large, white and covex, each bearing a single, white, fine hair about equal in length to one of the segments ; on segment 13 the arrangement of tubercles is the same as for segments 5-12 ; segments 3, 4 have them all in a central row as usual ; segment 2 has a row of 10 hairs along front margin. The spiracles are small, whitish ovals. The colour of larva is green (at the end of first stage ; yellowish immediately on emergence), with a mottling of blackish along the lateral region ; anal points yellowish-fleshy at base ; these points are at this stage as long as one of the segments of the body ; but they decrease in size with each moult. Size of egg-larva at end of 1st stage is L.: 5mm ; B : 0·7mm.

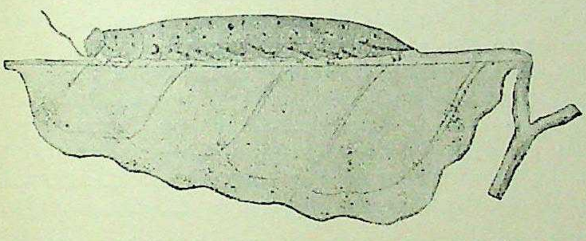
*Pupa.*—There is not much by which this can be distinguished from the pupa of *P. pingasa* which is described in detail below ; in shape and colour and markings they are extremely similar.

*Habits.*—The eggs are laid in batches of six and more in number on the upper surface of a leaf, close together though more or less without order. In this *N. hippia* differs from *pingasa* for the latter always lays the eggs singly, never more than one on any one leaf. The habits of the caterpillar and of the imago are very similar to those described under *pingasa* but the butterfly is found in much opener places than this latter species. While *pingasa* frequents heavy jungle, *hippia* is never found there, although there may be but a few miles distance between the two places ; the latter is much more of a sun-loving insect than is *pingasa*. In the Kanara District, for example, the present species is found all along the bases of the hills not a mile from the sands of the sea-shore where the jungle is scrubby and moderately open, consisting of deciduous trees ; the other does not leave the evergreen, shady jungles a mile or less away, stretching up on to the tops of the hills above to a height of close on 2,000 feet, and here, even, it keeps to the cover of the undergrowth. The food-plant of *hippia* larva is *Capparis heyneana*, the same as that of the other ; but it is extremely probable that it will eat other Capers also. *Pareronia hippia* is found nearly throughout Continental

India except in the desert tracts; in Assam, Burma and Tenasserim, extending to the Malay Peninsula.

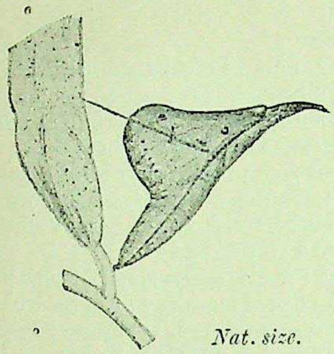
**126. Pareronia pingasa.**—Resembles *P. hippia*, Fabr., in colour and disposition of markings, but differs as follows:—Male, *upperside*: ground-colour a deeper blue. Forewing: the terminal, black border much broader, generally entirely without the transverse, subterminal series of bluish-white spots; in a few specimens there are one or two of these spots present, but nothing like the series so conspicuous in *hippia*. Hindwing: the terminal, black border very broad, narrowing distinctly, though slightly towards the tornal angle. Proportionally this border is even broader than in the forewing. *Underside* as in *hippia*.—Female closely resembles the female of *hippia*, but on the *upperside* the outer, black margins beyond the discal markings of both wings are proportionately much broader; the transverse, subterminal series of spots that crosses the wing is further from the terminal edge. On the *underside* the black, terminal borders are broader and darker, the subterminal series of spots on the apex of the forewing and on the hindwing absent, or so very thickly overlaid with the dusky brownish-black of the terminal margin as to be very indistinct and blurred. Antennæ, head, thorax and abdomen as well as eyes as in *hippia*.

*Larva*—(*Vide* marginal fig.).—Body cylindrical, shortly erect-haired, with distinct, impressed, transverse, parallel lines to each segment as usual; widest at middle about segment 7, narrowing gradually to tail-end, considerably less towards head; anal segment dorsally flattened, somewhat slightly constricted about middle, and produced behind into two short, diverging points which are close together and separated by a concave sinus: both are set with hairs and reach well beyond the anal claspers. Head round, somewhat flattened on face; surface finely rugose, set with fine, light hairs; eyes black; the whole head a slightly lighter green in colour than the body. Segment 2 slightly narrower than head. Surface of body smooth with the usual tubercles to each segment hardly perceptible, each bearing a single, small, erect seta or hair: subdorsal, dorsolateral, supra and subspiracular. Spiracles oval, black except those of segments 2, 11 and 12 which are larger and yellow in colour, bordered thinly with black. Colour of larva is dark-green, each tubercle a small, brown spot except the subspiracular ones which are green like the body; the tubercles of course arranged on segments 5-13 as usual: the subdorsal near front margin, the dorsolateral nearer the hinder margin, the others central; segments 3, 4 with them all central in a row; segment 2 with them along front margin; from behind each spiracle a diagonal, chequered, brown band runs up and forwards on to the preceding segment; this band varying in intensity of colour in different individuals; on segments 5 and 12 a large, spiracular patch of brown with two or three white spots on it: these patches fading before pupation; tail-points brown, connected spiracularly with patch on segment 12 by a brown line; true legs red-brown. L: 41 mm; B: 6 mm; H: 5 mm.



*Nat. size.*

*Pupa*—(*Vide* marginal fig.).—Shape as in figure in margin. Head slightly convex dorsally and ventrally; vertex small; segment 2 dorsally convex



*Nat. size.*

like head ; the latter produced out in front into a long snout, circular in section, sharp at extremity, much upcurved ; this snout is as long as the head, segment 2 and half of segment 3 together. The part of pupa composed of segments 5-14 is bent back at right angles to the portion made up of snout and segments 1-4 so that the dorsal line of the former portion is at right angles to the dorsal line of the latter (or nearly so), the wings being produced out ventrally into a very prominent bulge or curve, parabolic in shape, the line of junction of the wings rounded, their surfaces flat, the one leg of the parabola being the ventral line of pupa gradually diverging from the longitudinal axis of pupa from front to about opposite segment 7, where is the apex of the bulge, whence the other leg descends again to join the abdominal, ventral line at hinder margin of segment 8; thorax broadest at shoulders, whence the pupa is parallel-sided to end of segment 7 ; dorsally the thorax is somewhat humped ; the lateral constriction where the body loop passes at segment 5 is slight ; the transverse section of abdomen dorsally is triangular, ventrally is an arc of a circle, so that the dorsal line of it is slightly keeled ; the cremaster is parallel-sided, rather flattened, concave as to hinder margin. Colour of pupa is a dull, light green, somewhat glaucous, darker on wings which have a black, discocellular splash and some small, brown spots ; a dark, dorsal line and a yellow, supraspiracular line ; a black postspiracular spot on each segment, slightly below the spiracle ; a yellow, dorsolateral and subdorsal spot and a large, black mark under the subspiracular spot of segment 8. L : 30 mm.; B : 6 mm. at shoulders ; H : 13 mm. at apex of wing-bulge ; L. of snout : 5 mm.

*Habits.*—Egg always laid singly. Larva lives generally about the stalks when full-grown but rests on the uppersides of leaves in the earlier stages. It covers the leaves, stalks and small twigs of the food-plant with a silvery coating of web which looks like a snail's slime ; eats the leaf on one side of the midrib first, then on the other, leaving the rib intact ; it starts from the base of the leaf and rests along the eaten edge, that is on the midrib and eaten part, and generally finishes off the leaf by eating the softer part, the tip, of the rib itself before betaking itself to a new one. It walks in a slow, halting fashion, eats continuously and wanders often long distances before pupating. The pupa is always attached to the underside of a leaf or thin twig ; it takes about 36 hours from the time the larva has finished suspending itself to the formation of the pupa. The places chosen for deposition of the eggs are always shady, cool and often very close to the ground ; invariably in big jungles, mostly in evergreen parts and over 1,000 feet above sea-level as a rule. More minutely, the position chosen is the upperside of an old leaf, the end of a thorn or a little dry twig. The egg is just like that of *hippia*. The butterflies are quite strong fliers but keep always to the shade of the underwood and are not often seen in the full glare of the sun or in the open ; they fly straight ahead with an even, continual up-and-down motion of the wings above the horizontal; the females are not so often seen as the males but may be found sitting oftener than the males, generally on a leaf, above or below, always with the wings together over the back, the forewings hardly at all drawn into the hinder ones. The insects do not seem to go much to flowers and are never found at water. The females may be caught when fluttering about in the underwood laying eggs; the males must be taken in their flight; and it is not always an easy thing to get them, for they are good at dodging and have plenty of trees to facilitate their escape.

The female of this butterfly is not quite such a strong, active insect as the male or, at least, is never found flying in the same way, she is generally seen fluttering around in the underwood. She is rather like a *Danais aglea* at first sight, the wings being marked in a similar manner, though of course they are rather different in shape; the green eyes, however, at once give her away. These fade after life is extinct, in a very few days becoming a reddish brown.

The food-plant of the larva is *Capparis heyneana*, the same as that of *hippia*; it is a thorny, scandent bush generally found in the evergreen-forest regions of the Western Ghats in the Bombay Presidency. It is a common species.

*P. pingasa* is found in Kanara, the Nilgiris, Mysore, Malabar, Cochin, Travancore and the South Andaman Islands. The other species, *P. ceylanica*, inhabiting Ceylon is supposed to be distinguished from it by having the "terminal black border not of even width throughout, distinctly narrowed posteriorly." The Kanara specimens do not all absolutely tally with the description given for *pingasa* or that of *ceylanica*.

(*To be continued.*)

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# SOME NOTES ON THE BIRDS OF THE KAGHAN VALLEY, HAZARA DISTRICT, N.-W. FRONTIER PROVINCE.

BY

CAPT. C. H. T. WHITEHEAD.

Colonel Buchanan, C.B., has already given a very long list of the birds of Hazara in the interesting *Gazetteer* of that District; but as he did not visit the Kaghan, a certain number of species more or less confined to that valley were omitted. I append :—

I.—Additions to the above list.
II.—Some nesting and other notes on some of the species met with.

The Kaghan Valley is the most northern strip of British India. It lies to the north of Abbottabad wedged between Kashmir on the east and Tribal territory on the west, varying in elevation from 3,000 to over 17,000 feet, and is some 60 miles in length. The mule road from Abbottabad to Chilas and Gilgit traverses it.

The numbers in front of the scientific names refer to "*The Fauna of British India Birds*," by Oates and Blanford.

155 species were met with in all between 17th May and the 31st July (*viz.*, a month in 1908, 7 weeks in 1909, 6 weeks in 1912), but as most of my time was spent above 9,000 feet, many must have been missed.

Mr. E. C. Stuart Baker and Doctor C. B. Ticehurst have very kindly identified my specimens at the British Museum and Tring.

## I.

Additions to Colonel Buchanan's List of the Birds of Hazara.

38. *Ægithaliscus niveigularis.*—White-throated Tit.
199. *Hodgsonius phœnicuroides.*—Hodgson's Short-wing.
283. *Molpastes intermedia.*—Punjab Red-vented Bulbul.
(Common in Abbottabad).
352. *Anorthura neglecta.*—Kashmir Wren.
363. *Acrocephalus stentoreus.*—The Indian Great Reed-Warbler.
366. *Acrocephalus dumetorum.*—Blyth's Reed-Warbler.
(Noted in Abbottabad, May 16th).
367. *Acrocephalus agricola.*—Paddy Field Reed-Warbler.
369. *Tribura major.*—The Large-billed Bush-Warbler.
405. *Phylloscopus affinis.*—Tickell's Willow-Warbler.
406. *Phylloscopus tytleri.*—Tytler's Willow-Warbler.
416. *Phylloscopus subviridis.*—The Brooks's Willow Warbler.
519. *Oriolus galbula.*—The European Oriole.
(Recorded by Rattray from the Galis, see Vol. XVI (3), p. 406.)
589. *Alseonax ruficaudus.*—The Red-tailed Flycatcher.
639. *Ruticilla frontalis.*—The Blue-fronted Red-start;
651. *Calliope pectoralis.*—The Himalayan Ruby-throat.
654. *Ianthia rufilata.*—The Red-flanked Bush-Robin.

666. *Merula maxima.*—The Central Asian Black bird.

675. *Merula ruficollis.*—Red-throated Thrush.
(One shot by Mr. D. Donald, C.I.E., out of a host of *M. atrigularis* in a jhil in February 1911.)

*Oreocincla whiteheadi.*—sp. n. The Kaghan Mountain Thrush.

708. *Cinclus kashmirensis.*—The White-breasted Dipper.

712. *Accentor nepalensis.*—The E. Alpine Accentor.

719. *Tharrhaleus jerdoni.*—Jerdon's Accentor.

743. *Pycnorhampus carneipes.*—The White-winged Grosbeak.

753. *Pyrrhospiza punicea humii.*—Red-breasted Rose-Finch.

754. *Propasser thura.*—The White-browed Rose-Finch.

768. *Callacanthis burtoni.*—Red-browed Finch.

823. *Hirundo erythropygia.*—Sykes's Striated Swallow.
(Common in Lower Kaghan—one shot).

850. *Anthus rosaceus*—Hodgson's Tree Pipit.

856. *Otocorys longirostris.*—Long-billed Horned Lark.

1004. *Indicator xanthonotus.*—Yellow-backed Honey Guide.
(Observed at Donga Gali.)

1072. *Cypselus leuconyx.*—Blyth's White-rumped Swift.

1210. *Hiräctus pennatus.*—The Booted Eagle.

1230. *Milvus melanotis.*—Large Pariah Kite.

1296. *Columba leuconota.*—The "Snow" or White-bellied Pigeon.

1380. *Lerwa nivicola.*—The Snow Partridge.

## II.

38. *Ægithaliscus niveigularis.*—White-throated Tit.

Is not common. I only met it with twice, once above Bhimbal and again a party in Manúr Katta. Habits appeared similar to those of the Long-tailed Tit. Call very like the gold finch's "wi." 2 preserved and sent to the British Museum.

199. *Hodgsonius phœnicuroides.*—Hodgson's Short-wing.

Is found sparingly throughout the valley from 7,500 to 9,500 feet, wherever there is forest with suitable undergrowth. It has a pleasing song usually sung from the midst of a thick bush. Its call resembles the words "He did so" rather like *Ianthia rufilata*. An intruder to the nesting area is at once greeted by its harsh alarm notes accompanied by much flirting of the tail. A nest found near Batta Kundi was built near the ground in a patch of Kanúla (*Sambacus ebulus*). It reminded me very much of a Nightingale's but more solid. The eggs are plain deep sky-blue.

320. *Sitta kashmirensis.*—Brook's Nuthatch.

Brook's Nuthatch is common locally. This species plasters up its nesting hole with mud like the common Nuthatch.

323. *Sitta leucopsis.*—Chestnut-bellied Nuthatch.

My shikari discovered a nest of the White-checked Nuthatch with 3 eggs *in a hole in the ground* below the root of a standing Silver Fir, an unusual situation, I believe.

358. *Regulus cristatus.*—Gold Crest.

Is not uncommon near the upper tree limit.

Its single shrill much repeated call-note and its characteristic way of hovering in the air under a branch (apparently to take insects) distinguish it at a distance from other small warblers.

Only one nest was found, it was placed 30 feet up in a paluda in a typical situation. It contained 3 young ones and one addled egg. The latter was white with large dark red spots—very different from the normal type—but Colonel Buchanan who has seen many nests tells me that the white heavily-spotted type was the one he has usually met with out here.

367. *Acrocephalus agricola concinens.*—Chinese Paddy Field Reed-Warbler.

This bird has not I believe been previously recorded from British India. True *A. agricola* breeds in the reed beds of Kashmir. But further west this race, curiously enough, appears to be the common one, large numbers passing through Kohat on migration and many stay to nest in the Kaghan. Unlike typical *agricola* it nests in undergrowth (Kanúla) on the hill side far from water. Feeling doubtful of its identity I shot several on their return to their nests. Both Dr. Ticehurst and Mr. Stuart Baker agree that they are typical specimens. It starts nesting at the end of June—7 nests with eggs were found in all. Both nest and eggs resemble those of *A. stentoreus* but the nest is much neater and built within a few inches of the ground. It is usually woven round 4 stalks (in one case 3) in true reed warbler fashion, composed of stems and grass, neatly lined with roots, and in some cases with an edging of green grass woven round the top of the cup.

The cock-bird at this season throws off his skulking habits and may generally be seen in a conspicuous position singing his high pitched squeaky song accompanied by much craning of the neck and erecting of the feathers of the crown.

369. *Tribura major.*—Large-billed Bush-Warbler. The Large-billed Bush-Warbler or the "tick-tick pitta" as it is appropriately dubbed locally from its notes.

Only observed near Batta Kundi where it breeds. The song is very like that of the Grasshopper Warbler. Nest and eggs of usual type, this bush-warbler is an adept at skulking, it can seldom be induced to fly off its nest. Instead of slipping off it runs mouselike away at an amazing speed taking excellent cover all the way.

406. *Phylloscopus tytleri.*—Tytler's Willow Warbler.

Occurs in pine and paluda forest from 9,000 feet to tree limit but is not common. The nest is particularly difficult to find. I chanced on one at 9,800 feet built 30 feet up in a Blue Pine—it was of the usual domed type but very frail, composed of grass lined with feathers and hair. Eggs as previously described. The hen was shot and proved to be typical (now in British Museum).

416. *Phylloscopus subviridis.*—Brook's Willow Warbler.

Has a most peculiar song (*pi-pi-pi-az-z-z*) which at once distinguishes it from all other species. In my notes on the Birds of Kohat, etc. (see Vol. XX, No. 1, p. 191). I incorrectly ascribed this song to Humes's Willow Wren as I shot one, in the act as I thought, of singing this song, whereas *P. subviridis* must have been there too well under cover as usual when *P. humii* foolishly exposed himself close by. Occurs in the forest from 9,000 feet upwards, but is rather scarce.

639. *Ruticilla frontalis.*—The Blue-fronted Red start.

Is fairly numerous from 10,000 to 13,000 feet on open hill sides. A nest with 4 eggs was found at 12,000 feet was neatly made of grass well-lined with moss and feathers and placed in a hollow in the ground. Many nests with young and one or two in the building stage were also found.

*Alarm note*—ee-tit tit, very robin-like alarm.

644. *Ruticilla rufiventris.*—Indian Red start.

Is one of the commonest birds of the valley above 8,000 to 13,000 feet. Eggs as described by Marshall, *i. e.*, very pale blue.

651. *Calliopé pectoralis.*—The Himalayan Ruby-throat.

Is abundant from 9,000 feet up to 14,000 feet at least. A nearly fledged Cuckoo was found in one nest attended by its minute foster mother. A lizard's tail being one of the delicacies provided ! In another nest above Gitti Das at 13,000 feet a pale sky-blue Cuckoo's egg (unmarked) was taken, this is interesting in view of Stuart Baker's and Major Magrath's notes on blue eggs of this species, *vide* Vol. XVIII, p. 261.

*Oreocincla whiteheadi*, sp. n.—The Kaghan Mountain Thrush.

Mr. Stuart Baker described this new species at a meeting of the B. O. C. on the 14th May 1913. "Adult, nearest to *Oreocincla molissima* (Blyth), but differs in having the whole upper plumage olive-grey instead of rich olive brown with a strong rufescent tinge; underparts also without any of the bright rufous tint, which is always present to a greater or less extent in *O. molissima*, though there is a very slight tinge of ochre on the breast of one of the adult birds; the whole crown of the head is strongly marked with pale shaft stripes, a character never present in the adult of *O. molissima*. Bill from gape 28·4 mm., from feather of forehead, 21·6; wing 142·5—150; tail 95·4—98: Tarsus 30·4. Younger examples shew the same comparative differences as are shewn in the adults, *i. e.*, they are much less rufous both above and below; they are also much more strongly striated and have the dark margins of the feathers of the upper parts more conspicuous."

Mr. Stuart Baker added that *Oreocincla molissima* and *dixoni* are inseparable. Their range, *viz.*, Chamba to the Shan States is identical and there is no constant difference between the two.

(Bulletin of the B.O.C., Vol. XXXI, No. 188, dated 28th May 1913.)

I found this fine thrush comparatively common in one wild precipitous valley, the home of several other rare species such as the Snow Partridge (*Lerwa nivicola*).

It differs from *O. molissima* which is a forest bird, in inhabiting bare rocky slopes above tree limit between 12,500 and 14,500 feet and in nesting in clefts in cliffs. Its alarm notes are similar to those of *Merula maxima* (like a policeman's rattle) which occurs on the same ground at a slightly lower level; also the single call-note. I was too late in the year for the song. One brood just flown I found on 12th July on a snow slope, the parents busily feeding them. Another on the 14th not yet flown in a cliff. Once the young can shift for themselves it becomes very wild and difficult to approach. The broad white bar edged with black under the wing distinguishes this thrush from afar from all other species occurring here.

The ♂ and ♀ are very similar in colouring.

753. *Pyrrhospiza punicea humii*.—The Red-breasted Rose-Finch.

Another scarce species from the same valley where it is common between 12,000 and 14,000 feet. Both ♂ and ♀ exactly answer to Sharpe's description of this subspecies which is now generally recognized. It has a cheery Bulbul-like call-note which may be rendered "*are you quite ready*." The male constantly sings short snatches of a soft, erratic warbling song.

The only nest found was being built on a ledge on a cliff and not in a bush as described in the "Fauna of B. I. Birds." Like other rose-finches this species feeds a lot on flowers and buds.

The colour of the soft parts except the bill are not recorded by Oates, they are as follows:—

*Bill* light horn brown, *lower mandible* whitish. *Tarsus* black. *Iris* hazel.

820. *Motacilla personata*.—The Masked Wagtail.

Breeds in small numbers along the river from 3,000 to 9,000 feet. A nest found at 8,800 was built on an island in a torrent under a bush, and contained 5 eggs of the usual type.

I looked out carefully for *M. hodgsoni* but did not see a single bird.

838. *Motacilla citreoloides*.—Hodgson's Yellow-headed Wagtail.

Abounds from Narang (7,700 ft.) upwards and breeds freely; the male generally in mature plumage and the female in one of 2 plumages, *viz.*, (1) above grey with scattered black feathers; supercilium and below yellowish white, (2) above dark grey with some black feathers; forehead, supercilium and under part canary yellow. The latter appears to be the adult female, for apparently they never assume, except perhaps as a freak, the adult males garb. The former is probably the female in the first year. This is the opinion of Dr. C. B. Ticehurst, who kindly went through the series of this species which I sent home and afterwards exhibited them at the B. O. C. Meeting on 9th April last, and also of Mr. Stuart Baker.

856. *Otocorys longirostris.*—The Long-billed Horned Lark.

Is not uncommon near the head of the valley above 11,500 feet. The nest is merely a hollow scantily lined with grass and vegetable down. Nine nests in all were found with eggs. The full clutch is 2, and occasionally 3. The eggs are pale stone-coloured and small for the size of the bird.

Whilst watching the first nest, the hen returned and at once set to work to remove the eggs by rolling them carefully down the slope with her bill. This also happened at another nest.

This lark is extremely hardy, by mid June many clutches had already been hatched out even up at 13,000 feet where clear of snow. On June 26th, on the top of the Babusar Pass 13,580 feet a blizzard swept spot, we found a nest containing 3 young—2 of these were dead, evidently killed by the blizzard which had been raging for 12 hours almost on end—the parents were still busily getting food for the survivor.

Some 5 yards from another nest was found a single egg not one of the Larks as it was smaller and nearly glossless. It must, I think, be a Cuckoo's (*C. canorus telephonus*) as this species was very common in those parts.

The young are plain brown above, spotted with fulvous brown, otherwise resembling the adult ♀.

*Alarm note*—a whistling *peo* or sometimes *ee-up*.

In nestlings the gape was orange with one black spot on the tip of the inside of the lower mandible, another on the tip of the tongue and a kidney-shaped one in the centre of the tongue.

1104. *Cuculus canorus telephonus.*

The cuckoo is abundant up to 14,000 feet. I was surprised to find several calling above 13,000 feet where everything was under snow as early as May.

At the higher elevations they appear to continue calling to a later date. They were still cuckooing on July 24th when I left the head of the valley but none were heard lower down.

I found a young cuckoo in the nest of the Himalayan Ruby-throat (*Calliope pectoralis*), and in another nest of the same species got a pale blue cuckoo's egg about double the size of the Ruby-throat's and much paler.

Stuart Baker does not mention this species among the list of the foster parents of the Cuckoo (B. N. H. S. J. Vol. XVII, p. 78 and p. 881). I also suspect an egg found outside the nest of a Long-billed Horn Lark belonging to this species. A rufous female I shot containing a half-formed egg is now in the National Collection.

1208. *Hieraëtus pennatus.*—The Booted Eagle.

Is not uncommon in summer in the Western Himalayas at least as far East as the Sutlej Valley, though it is only supposed to be a winter visitor (*vide* Fauna of India).

A nest was found at 10,000 feet on 22nd June. It was a huge platform of sticks lined with green pine-needles on the top of a Blue Pine (*Pinus excelsus*). It contained a single plain white egg. There were 2 holes* in it and the contents were nearly dried up. However the female was still incubating it. As I could not satisfactorily identify her, I was obliged to shoot her (the skin is now in the British Museum).

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* Mr. S. L. Whymper has had a similar experience with Eagle's eggs and believes that it is due to their removing or trying to remove them from their nests (Vol. XVIII, p. 187). Or perhaps it is due to their leaving their nests in a great hurry.

Mr. Stuart Baker has only heard of one other nest being found in India, *viz.*, in Kashmir by Mr. Crump, Col. Ward's Collector.

It utters weird cries at this time of the year, one series is rather like the call of the Himalayan Pied Woodpecker but more musical, varied, and proprotionately louder and on the wing it goes through wonderful evolutions, and give vent to more striking whistling notes.

1260. *Falco subbuteo.*—The Hobby.

I was surprised to find a Hobby's nest on the ridge above Jabba on 18th May. It seems to be a very low elevation (=3,800 ft. ) for this species.

1380. *Lerwa nivicola.*—Snow Partridge.

I only met with the Snow Partridge (native name Părahút) in one valley. but there it was comparatively common between 12,500 and 14,000 feet. I have never seen such a delightfully tame, inquisitive game bird. Its muscal whistling call was constantly heard. On July 2nd I caught a family of 5 chicks, but unfortunately they proved too delicate to rear. Next day I stumbled on a hen sitting on 3 eggs. There was no nest, just a hollow unlined scraped under a bush. This differs from those found by Whymper (Vol. XIX, p. 990) in there being no nest and in not being placed on a cliff ( the ground however was very precipitous ). The eggs were cream coloured spotted all over with red.

On returning to this spot in 1912, I only found a single pair after a prolonged search and the shepherds assured me that there was cnly one other pair left in the valley. This is the result of there being no bird or even game preservation laws for the breeding season in these parts. Its confiding habits at this time of the year make it an easy prey.

# A LIST OF GRASSES FROM AHMEDABAD AND SURAT

## *With notes on their habitats, ecological relations, and time of flowering.*

BY

L. J. SEDGWICK, I.C.S.

These notes are based on observations made at Surat during the rains of 1912 and at Ahmedabad during the rains of 1913. Consequently the areas worked are (1) the immediate neighbourhood of Surat City on the south side, say, the area contained in the southern quadrant of a circle drawn with a 6-mile radius from Nanpura, and (2) the immediate neighbourhood of Ahmedabad, say, an entire circle drawn with a 5-mile radius with its centre at the Delhi Gate. A few species are recorded from the eastern parts of the Surat and northern parts of the Ahmedabad districts. But for the most part the records are from the above-mentioned areas. The authorities used are Lisboa's Monograph on Bombay Grasses and Cooke's Flora of the Bombay Presidency. The latter, which is really a very fine work, is the foundation of a record of the distribution of plants in this Presidency which will require revision from time to time in the future in order to incorporate the results of new observers, as well as to correct some of the descriptions which err occasionally through want of fresh specimens for examination. In no point is the treatment of the order *gramineæ* more incomplete than in the accounts of the distribution of the various species. It is apparent that Professor Cooke had to base his accounts of distribution on the recorded habitats of the specimens in the herbaria of about four or five collectors only. In very few cases has he ventured to describe a grass as being "common" either throughout the Presidency or in a particular area. Among recorded habitats Gujerat figures very rarely, for which reason the present list may be of use to future workers. And it will be noticed that five species are entered in this list which are not given by Cooke as denizens of the Presidency. From the fact that among these is *Chloris virgata*, Sw., which is one of the most abundant and hardiest of grasses in Gujerat the reader will realize what a lot of additions to Professor Cooke's Flora must be expected in the future. In this connexion I would like to throw out a suggestion that the Society might undertake the compilation of a catalogue of plants on the lines of the London Catalogue, in which after dividing India into botanical provinces, each with a separate member, the numbers of the provinces in which each plant has been recorded up-to-date would be entered against the name of the plant. Those who are acquainted with the London Catalogue are aware of its usefulness to field botanists, both as fixing nomenclature and as affording a bird's-eye view of the distribution of species.

The specimens recorded in this list have been in all cases of doubt identified for me by Mr. R. K. Bhide of the Agricultural College, Poona, a recognised authority on Indian grasses; and my thanks are due to him as well as to Dr. H. H. Mann and Mr. W. Burns for advice and assistance from time to time.

In the accompanying list the ecological associates of the various species are mentioned whenever they are sufficiently certain and obvious. Besides this I have distinguished the following types of prevalence :—*Dominant* (D.), in the case of those grasses which are sufficiently powerful to form the basis of the vegetation over fairly large tracts of, say, an acre or two; *subdominant* (SD.) where the species is too slender or delicate to form the basis of a vegetation, but is sufficiently powerful to occur in patches of, say, a square yard or two here and there, or to straggle erratically in lines or veins, and *sporadic* (Spor.) where the species is so slender as to occur only as single plants whether commonly or rarely. Of course the large majority of plants are sporadic in the above sense, but in every type of vegetation there must be a dominant form, and grasses owing to their hardiness more often furnish the dominant species than any other natural order.

The nomenclature followed is that of Cooke, except in the case of the hitherto unrecorded species, where I have entered the names as given by Mr. Bhide from Hooker's Flora of British India. These species are marked with an asterisk.

Cultivated species and garden escapes are not mentioned.

### 1. PENNISETUM, Pers.

1. *P. cenchroides*, Rich.

Very common at Ahmedabad in association with *Cenchrus biflorus*, Roxb. These two form the principle early fodder both in compounds and on the borders of fields. Cooke's date of flowering (December) is quite wrong so far as N. Gujerat is concerned, where they flower in June and July. (D.)

2. *P. setosum*, Rich.

An alien, only observed in the grass plot at the Bhadar, Ahmedabad, where famine grass had been stored in 1911-12, and so probably seeded from that grass.

3. *P. pedicillatum*, Trin.

An alien, in the same circumstances as *P. setosum*.

### 2. CENCHRUS, L.

1. *C. biflorus*, Roxb.

Abundant at Ahmedabad in association with *Pennisetum cenchroides*, Rich. (q. v.). Very hardy and flowers spasmodically right through the dry season. (D).

2. *C. catharticus*, Delile.

Common in all sandy wasteland, sandy fields and riversides at Ahmedabad. Flowers mid-monsoon. The spikelets of this grass, which are easily detachable from the rachis and are viscid, are most troublesome when walking, as the bristles of the involucel are strong, recurved and extraordinarily sharp. (Spor.).

### 3. Setaria, Beauv.

1. *S. glauca*, Beauv.

Common at Surat. (SD.)

2. *S. intermedia*, Roem. et Schult.

Surat and Ahmedabad. Fairly common at Surat. (SD.)

3. *S. verticillata*, Beauv.

Surat and Ahmedabad. Fairly common in hedges at Ahmedabad, especially where the soil is good. Flowers mid-monsoon. (SD.)

### 4. Axonopus, Beauv.

1. *A. cimicinus*, Beauv.

Fairly common at Ahmedabad on roadsides and the edges of fields. Flowers mid-monsoon. (Spor.)

### 5. Panicum, L.

1. *P. flavidum*, Retz.

Common both at Surat and Ahmedabad in rich soil especially in compounds. Flowers mid-monsoon. (SD.)

2. *P. punctatum*, Burm.

Banks of the Chandola Canal, Ahmedabad. (SD.)

3. *P. colonum* L.

Abundant, Surat and Ahmedabad, everywhere except the sandiest soil. Flowers throughout monsoon. (D.)

4. *P. Isachne*, Roth.

Occasional in compounds and fields, Surat. (Spor.)

5. *P. prostratum*, Lamk.

Common, Surat. (SD.)

6. *P. setigerum*, Retz.

Common, Surat and Ahmedabad. (SD.)

7. *P. javanicum*, Poir.

In rich manured soil in compounds, Ahmedabad. (SD.)

*8. *P. dystachyum*, L. (teste R. K. Bhide.)

Occasional on sandy uplands among other taller vegetation, Ahmedabad, west of the river. Flowers mid-monsoon. (Spor.)

*9. *P. miliare*, var. *hirsutum*, Lamk. (teste R. K. Bhide.)

Very common at Ahmedabad on all rich lowlying ground which is liable to accumulation of water during the monsoon, but is not low enough to form a tank, often in association with small babhul bushes. It is a either a dwarf grass or the forms observed were all reduced. Flowers throughout monsoon. (D.)

### 6. Digitaria, Rich.

1. *D. sanguinalis*, var. *ciliaris*, Prain.

Abundant everywhere, Surat and Ahmedabad, forms the principle ingredient of the head loads of green grass brought in during the middle and end of the monsoon. (D)

2. *D. Royleana*, Prain.

One specimen found in a compound at Surat. This grass has hitherto been held to occur only in the hills. Unfortunately as only one plant was observed it cannot be declared to be a denizen of Surat, and may have been a casual.

### 7. Papsalum, L.

1. *P. distichum*, L.
In the Victoria Gardens, Ahmedabad. This may be an alien imported with garden seeds.

### 8. Eriochloa, H. B. et K.

1. *E. polystachya*, H. B. et K.
Wet places, Surat and Ahmedabad. Especially common along the banks of the Chandola Canal, Ahmedabad, in association with *Panicum punctatum*, Burm (q. v.). Flowers mid and late monsoon. (SD. or almost D.)

### 9. Saccharum, L.

1. *S. spontaneum*, L.
Common, Surat, and very common, Ahmedabad, on natural waste land in valleys and the edges of nullahs, often in association with *Andropogon Squarrosus*, L. Flowers from September onwards. (SD. or almost D.)

### 10. Erianthus, Michx.

1. *E. Ravennæ*, Beauv. (teste R. K. Bhide.)
Abundant at Ahmedabad on all waste sandy ground. This grass, which is usually erroneously called "Pampas grass" by European residents, is not only a conspicuous feature of the landscape round Ahmedabad, but has an important economic use, as its long stiff stems are tied together to form tatties for thatching and sold by the Waghris and Marwari gipsies of Ahmedabad. From the fact that its clumps are often found in conspicuous lines it may be inferred that it used to be planted. It is a great hiding place for hare, jackal, quail and other animals. In Gujerati it is called "Sarkhat." Cooke's description is defective in several particulars, the dimensions of length both of the stem and the leaves being understated, and the dimensions of the breadth of the leaves overstated. He describes the leaves as flat whereas they are, except at the tip, deeply grooved. This grass is essentially a sand-grass and is typical of North-West India. Ahmedabad is probably its furthest southern limit. Flowers, October onwards. (D.)

I venture to suggest that the genera *Saccharum* and *Erianthus* ought to be amalgamated. The differentiation of the occasional awn in *Erianthus* ought not to outweigh the remarkable similarity of habit between the two genera. *Saccharum spontaneum* is an exact miniature of *Erianthus Ravennæ*. The similarity of leaf-form, with the grooved and unequal-sided blade and conspicuous white midrib is very noticeable.

### 11. Pollinia, Trin.

1. *P. argentea*, Trin.
Not uncommon on roadsides at Surat. (Spor.)

### 12. Rottboellia, L. fil.

1. *R. compressa*, L. f.
On the banks of the Kankaria tank, Ahmedabad (Spor.)
2. *R. exaltata*, L. f. (teste R. K. Bhide.)
Fields of gourds, Ahmedabad. There is a taller and more glaucus *Rottboellia* which grows commonly on the roadsides at Surat. This I placed to *R. exaltata*, but Mr. Bhide's identification of the Ahmedabad specimens as belonging to that species make me doubt whether the Surat grass does not belong to a different species. Unfortunately I have no Surat specimens by me, and no access to that district at present. (Spor.)

### 13. APLUDA, L.

1. *A. varia*, Hack.

Abundant both at Surat and Ahmedabad and one of the principle fodder-grasses of both districts. In Surat it is usually associated with *Themeda ciliata*, Hack., (q.v.). (D.)

### 14. ISCHAEMUM.

1. *I. rugosum*, Salisb.

Not uncommon at Surat and Ahmedabad either as isolated plants or in small patches in fields. I observed some plants in my compound at Ahmedabad in which the lower involucral glume of the sessile spikelet was of a deep claret-red colour, instead of the ordinary creamy white. (SD.) But in wet places in valley bottoms in the Prantij Taluka dominant also.

2. *I. laxum*, Br. (teste R. K. Bhide).

In the Bhadar grass-plot where the famine grass was stored, and so probably an alien, Ahmedabad. The pedicillate spikelets of this grass had no awns as described by Cooke so far as the specimens examined at Ahmedabad go, and Mr. Bhide tells me that it is the same with the specimens in the Poona herbarium.

### 15. ARTHRAXON, Beauv.

1. *A. microphyllus*, Hochst.

Very common on the city walls, both at Surat and Ahmedabad, in association with *Aristida adscensionis*, L., and *Chloris tenella*, R., as well as the following flowering plants, *Linaria ramosissima*, Wall. and *Lindenbergia urticæfolia*, Link (both *Scrophularineæ*) (D.)

2. *A. ciliaris*, Beauv.

In the Bhadar famine-grass plot, Ahmedabad, and so probably an alien.

### 16. THELEPOGON, Roth.

1. *T. elegans*, R.

A single plant in a compound in the Bhadar, Ahmedabad.

### 17. ANDROPOGON, L.

* 1. *A.* (*Cymbopogon*) *Martini*, Roxb. (teste R. K. Bhide).

This is the largest but worst of the fodder grasses of the big "bids" in the Prantij Taluka. The whole plant has a highly resinous odour. (D.)

2. *A.* (*C.*) *pumilus*, Roxb.

Common on the high banks of creeks at Surat. Flowers late monsoon. (D).

3. *A.* (*Hypogynium*) *foveolatus*, Delile.

Common on sandy, alluvial soil, Surat, and occasional Ahmedabad. (SD.)

4. *A.* (*Amphilopis*) *pertusus*, Willd.

Common on pastures, Surat, and Ahmedabad (Spor.).

5. *A.* (*Sorghum*) *halepensis*, Brot.

Very common along the banks of the B. B. & C. I. Railway in the Surat district, and elsewhere Surat. In Ahmedabad only on the Bhadar famine-grass plot, and so probably an alien. But abundant in the north of the district. Reed pens are made from this grass (SD.)

6. *A.* (*S.*) *purpureo-sericeus*, Hochst.

At Ahmedabad only in the Bhadar famine-grass plot, and so probably an alien.

7. *A.* (*Dichanthium*) *caricosus*, L.

On the sides of roads and borders of fields, Surat, fairly frequent. (Spor.)

8. *A.* (*D.*) *annulatus*, Torsk.

Very common, Surat and Ahmedabad. The species of the subgenus *Dischanthium* and especially this species form the principal late fodder in compounds and middle class pastures. Grass is usually cut twice, once in August and once at the Divali. These *Andropogons* seem to mature *after* the first crop is removed. (D.)

9. *A.* (*Heteropogon*) *contortus*, L.

Surat and Ahmedabad, fairly frequent. This grass is usually called "spear-grass" in the Floras, but the common "spear-grass" of the Deccan is *Aristida adscenscionis* (q. v.). Flowers late monsoon. (D.)

10. *A. Squarrosus*, L. f.

This is the well-known "khas-khas" from the roots of which tatties are made. Cooke considers it as not a true native but I must differ from this view. The grass is found occasionally in Surat district (Jalalpur and Bardoli talukas) and commonly in the damper hollows near Ahmedabad and in the north of the district in circumstances which leave no doubt that it is a true wild denizen of Gujerath. Flowers late monsoon and after. (SD.)

### 18. THEMEDA, Torsk.

### (= ANTHISTIRIA, L.)

1. *T. Ciliata*, Hack.

This is abundant in Surat, and forms the principal fodder grass of that district. It is common but less universal in Ahmedabad (D.)

### 19. ISEILEMA, Hack.

1. *I. laxum*, Hack.

Not uncommon on alluvial soil, Surat. Flowers late monsoon. (SD )

### 20. POLYTOCA, Br.

1. *P. barbata*, Stapf.

Occasional, Surat, usually in association with *Themeda ciliata*, Hack. (Spor.)

### 21. ARISTIDA, L.

1. *A. Adscenscionis, L.*

Abundant on the city walls, Surat and Ahmedabad and on dry hills, Ahmedabad. This is the true "spear-grass" of the Bombay Deccan. (D.)

2. *A. redacta*, Stapf. (teste R. K. Bhide.)

Occasionally replaces the former on sandy waste at Ahmedabad. I suggested to Mr. Bhide, and he concurs that *A. redacta*, Stapf. and *A. funiculata*, Trin. ought to be amalgamated as one species. In that case *funiculata*, as the earlier name would have precedence. However without seeing Stapf.'s paper in the Kew Bulletin of 1892 and without more study of the forms we cannot definitely refuse to accept the differentiation, and as Mr. Bhide refers my specimens to *A. redacta* in preference to the other I have adopted that name. (D.)

### 22. TRAGUS, Haller.

1. *T. racemosus*, Scop.

Very common on shallow sandy waste, such as the barrener parts of hillsides and banks, Ahmedabad, always in association with *Gracilea, Royleana* (q. v.), *Indigofera cordifolia* (order *Leguminosæ*), and *Kyllinga triceps*, Rottb. (order *Cyperaceæ*), and usually with reduced forms of *Eleusine Ægyptiaca* Desf. (q. v.), *Chloris villosa* (q. v.) and the next species. The above are typical only of shallow soil. In deeper sand other forms come in. Of the above *Indigofera cordifolia* is the dominant species. All the others are subdominant except *Chloris* which is sporadic. (SD.)

### 23. PEROTIS, Ait.

1. *P. latifolia*, Ait.

Very common on sandy wastes and in sandy lanes and fields, Ahmedabad (v. supra). Cooke's note:—"Flowers Oct.—Aug." must be a mistake for flowers Aug.—Oct. (Spor. or almost SD.)

### 24. SPOROBULUS, Br.

1. *S. diander*, Beauv.

Very common Surat, and Ahmedabad. Flowers early and mid-monsoon. (SD.)

### * 25. LEPTOCHLOA.

*1. *L. polystachya*, Benth. (teste R. K. Bhide).

On the banks of the Kankaria tank, Ahmedabad.

### 26. ERAGROSTIS, Beauv.

1. *E. ciliaris*, var. *brachystachya*, Boiss.

Very common in all dry and barren places, Surat and Ahmedabad. Flowers late monsoon. (SD.)

2. *E. tenella*, var. *plumosa*, Stapf.

Very common in cultivated fields, Ahmedabad. Flowers mid and late monsoon. (SD.)

3. *E. interrupta*, var. *Koenigii*, Stapf.

Very common in cultivated field, Surat district (noted as far east as Bardoli); in Ahmedabad and north of the district only on black soil or in waterholes. (Spor.)

4. *E. amabilis*, Wight et Arn.

Common in compounds, Ahmedabad and one specimen on a roadside, Surat. Flowers late monsoon. (Spor.)

5. *E. Gangetica*, Steud.

On the margins of most tanks, Ahmedabad and north of the district. (D.)

6. *E. minor*, Host.

In compounds, Ahmedabad, often in association with *E. amabilis*. Flowers late monsoon. (Spor.)

7. *E. tremula*, Hochst.

A typical member of the sand flora, Ahmedabad. Common both on sandy waste and in sandy fields, but it will not grow in the shallow soil which supports the flora noted under *Tragus racemosus* (q. v.) only (Spor.) at Ahmedabad, but occasionally (SD.) and even (D.) in the north of the district.

8. *E. pilosa*, Beauv.

Very common in compounds, Surat and Ahmedabad. Flowers the whole monsoon. (SD.)

### 27. GRACILEA, KOEN.

1. *G. Royleana*, Hook. f.

Very common on the city wall, Surat, and on sandy hills, Ahmedabad. Only grows in very shallow earth. (v. sub *Tragus racemosus*) (SD.)

### 28. CYNODON, Pers.

1. *C. dactylon*, Pers.

The "hariali" grass, (though this name is not used by the natives of

Gujerat). Common. The peculiar feature of this grass is its capacity for retaining its chloroplastids unaltered by drought. It remains green, and even goes on flowering almost throughout the year. (D.)

### 29. Chloris, Sw.

1. *C. tenella*, Roxb.
Occasional on the city wall, and on banks, Surat. Very common in almost all situations, Ahmedabad. The racemes are described by Cooke as usually erect, but they are in reality almost always decurved. (SD.)
2. *C. villosa*, Pers.
Very common on sandy hills and barren pasture, Ahmedabad. (Spor.)
3. *C. barbata*, Sw.
In rich land and on the edges of tanks, Ahmedabad. (Spor.)
* 4. *C. virgata*, Sw. (teste R. K. Bhide.)
Abundant on the most gravelly and barren land by roads and in compounds, Surat and Ahmedabad. (D.)

### 30. Eleusine, Gaertn.

1. *E. Indica*, Gaertn.
Common in compounds and where water runs or accumulates, Surat and Ahmedabad. (SD.)
2. *E. Aegyptiaca*, Desf.
Abundant in all situations, Surat and Ahmedabad. Often reduced in shallow gravelly soil to two or even one spikelet. (D.)
3. *E. aristata*, Ehrenb.
Common on sandy soil, Ahmedabad, often associated with *Erianthus Ravennæ*; also on the Tapti banks, Surat. This grass is very slender and can only grow where there is freedom from all tall vegetation. (Spor.)

### 31. Dinebra, Jacq.

1. *D. Arabica*, Jacq.
Abundant in Surat and common in Ahmedabad as a weed of cultivation often in association with *Eragrostis interrupta*, var. *koenigii* (q. v.) Noted as far from Surat as Bardoli and Jalalpur.

### 32. Oryza, L.

There is a rice which grows in water holes in low valleys under the Chandola canal, Ahmedabad. This may be *O. coarctata*, Roxb. or an escape from cultivation.

### 33. Elytrophorus, Beauv.

1. *E. articulatus*, Beauv.
In dry rice fields in the Modasa Petha in the extreme North-East of the Ahmedabad district. (Spor.)

### 34. Aeluropus, Trin.

1. *A. villosus*, Trin.
Common on the sandy foreshores of creeks, Surat. (D. but often in "glorious isolation" as the only plant over large areas).

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# DESCRIPTIONS OF INDIAN MICRO-LEPIDOPTERA.

BY

E. Meyrick, B.A., F.R.S., F.Z.S.

## XVIII.

(*Continued from page 781 of Volume XXII.*)

### Stenomidæ.

*Stenoma ichnæa*, n. sp.

♂ ♀. 22-25 mm. Head and thorax whitish-fuscous or pale fuscous, thorax sometimes darker anteriorly. Palpi brownish-whitish. Antennal ciliations in ♂ 3. Abdomen light ochreous-grey. Forewings elongate, moderate, costa gently arched, apex rounded-obtuse, termen rounded, little oblique; whitish-fuscous, on dorsal $\frac{2}{3}$ more or less suffused with light fuscous and sprinkled irregularly with dark fuscous; a more or less developed fine dark fuscous streak along fold towards base; oblique dark fuscous spots on costa at $\frac{1}{4}$, middle, and $\frac{3}{4}$; stigmata small, dark fuscous, plical obliquely beyond first discal; a series of dark fuscous dots round apex and termen: cilia whitish-fuscous, with faint fuscous median line. Hindwings pale fuscous; cilia whitish-fuscous, with faint darker subbasal shade.

Anshi, Kanara, bred in January (Maxwell); six specimens. Larva green, head brown, collar black, with lateral (spiracular) series of black spots, also with black supraspiracular spots on 3, 4, and several of the posterior segments; feeding between spun leaves, or a broken portion spun on surface of a whole leaf, on *Symplocos spicata*: pupa very obese, making a constant clicking sound when disturbed (Maxwell).

### Gracilariadæ.

*Lithocolletis triplex*, n. sp.

♀. 10 mm. Head ochreous-whitish. Palpi whitish, ringed with dark fuscous. Thorax reddish-ochreous, partly tinged with whitish. Abdomen grey. Forewings lanceolate; bronzy-ochreous, tinged with reddish; three slightly inwards-oblique narrow white transverse fasciæ, at $\frac{1}{4}$, middle, and $\frac{3}{4}$, first two almost straight, third hardly angulated above middle, each nearly preceded by a considerable spot of blackish irroration on costa, and the second on dorsum also; undefined patches of blackish irroration on costa and termen near beyond third fascia, and a smaller one at apex: cilia pale greyish, on termen with basal half bronzy-ochreous, with a patch of blackish irroration above tornus. Hindwings dark grey; cilia pale grey.

Pykara, 7000 ft., Nilgiris, in April (Andrewes). Allied to *conformis*; a large and distinct species.

*Lithocolletis virgulata*, n. sp.

♂. 6 mm. Head and palpi whitish. Forewings narrow-lanceolate; ochreous-chestnut-brown; an irregular whitish median basal streak to $\frac{1}{4}$, irregularly irrorated with black, and connected with dorsum near base by a mark of black irroration; three somewhat inwardly oblique whitish transverse fasciæ, angulated above middle, lower portion sometimes mostly suffused with groundcolour, their margins marked with black irroration, posterior margins strongest but interrupted above angle, posterior margin of third running into apex: cilia whitish-ochreous, round apex irrorated with black points. Hindwings grey; cilia pale greyish-ochreous.

Manchikeri, Kanara, bred in May, from cocoons found on a *Ficus* (Maxwell); two specimens. It is exceptional for a *Lithocolletis* larva to pupate outside the mine. Mr. Maxwell writes "The noticeable thing was the extremely large size of the cocoon itself in proportion to the insect; the tree is a common one, but I have never noticed the cocoons elsewhere." The species is allied to *conformis*, but very distinct.

*Acrocercops civica*, n. sp.

♂ ♀. 6 mm. Head whitish mixed with fuscous. Palpi with appressed scales, white, with two bands on second joint and three on terminal dark fuscous. Thorax brownish irrorated with dark fuscous. Abdomen grey, beneath white, sides irregularly barred with dark fuscous. Forewings extremely narrow, elongate-lanceolate; brownish, irrorated with dark fuscous, costa suffused with dark fuscous, dorsum sometimes more or less strigulated with white; four transverse fasciæ composed each of a pair of white striæ more or less connected in disc but separated with dark fuscous at extremities, more widely on dorsum, first at $\frac{1}{3}$, second beyond middle, third at $\frac{2}{3}$, fourth at $\frac{5}{6}$, less well marked; a slender white transverse bar before apex, enlarged on costa and sometimes containing a dark fuscous speck: cilia pale grey, round apex with two dark grey lines. Hindwings grey; cilia light grey.

Karwar, Kanara, bred in July (Maxwell); ten specimens. Larva bright red, mining blotches in leaves of Cinnamon (*Cinnamomum zeylanicum*), many larvæ in each leaf; pupa orange, in external detached oval orange cocoon (Maxwell). Allied to *ordinatella*.

*Acrocercops pentalocha*, Meyr.

Larva mining blotches in leaves of Mango (*Mangifera indica*); pupa in external white flat oval cocoon (Maxwell).

*Acrocercops cathedræa*, Meyr.

Larva mining inconspicuous galleries in leaves of "Kungina" creeper.

*Acrocercops cylicota*, n. sp.

♂. 7 mm. Head shining white, face grey. Palpi slender, whitish, second joint suffused with dark grey towards apex, terminal joint with two rings and apex dark fuscous. Thorax shining white, with lateral ochreous-bronze stripes. Abdomen dark grey, beneath white, segmental edges dark fuscous. Forewings very narrow, elongate-lanceolate; ochreous-bronze; three shining white dorsal blotches edged with black, first antemedian, triangular, reaching costa, on dorsum rather broadly extended to base, second postmedian, rounded-triangular, not quite reaching costa, third narrow-oblong, extending along termen to near apex; a white apical dot: cilia grey, with a white patch on terminal blotch. Hindwings rather dark grey; cilia grey.

Karwar, Kanara, bred in June (Maxwell); one specimen. Larva mining blotches in leaves of *Colebrookea oppositifolia* (*Labiatæ*); pupa in cocoon in folded edge of leaf (Maxwell).

*Acrocercops isodelta*, Meyr.

One specimen sent by Mr. Maxwell as bred from the same plant with *A. cylicota*, and not recognised as distinct; the two species are generally similar but certainly distinct, and as only one of each was sent, the identification of the larva lacks precision, and needs further investigation.

*Acrocercops hexachorda*, n. sp.

♂. 8 mm. Head and thorax whitish. Palpi slender, whitish, with subapical ring of second joint, two rings of terminal, and apical edge anteriorly dark fuscous. Forewings very narrowly elongate-lanceolate; light brownish-ochreous; six slender oblique equidistant whitish fasciæ, edged with a few blackish specks, first at $\frac{1}{4}$, sixth towards apex; some blackish scales transversely arranged midway between first and base, and some scattered along dorsum: cilia ochreous-whitish, with an oblique black line crossing apex at base. Hindwings grey; cilia light violet-grey.

N. Coorg, at 3,500 feet, in January (Newcome); two specimens. Allied to group of *ordinatella*.

*Acrocercops scandalota*, n. sp.

♂. 7 mm. Head grey-whitish, collar ochreous-whitish. Palpi slender white, lined above with dark fuscous. Thorax ochreous-whitish, patagia dark fuscous. Forewings extremely narrowly elongate-lanceolate; dark bronzy-fuscous; a narrow ochreous-whitish streak along dorsum from base to tornus; close beyond this a triangular ochreous-whitish spot hardly reaching costa, followed by an oblique silvery-whitish costal strigula surrounded with blackish-fuscous; a small ochreous-whitish triangular spot on termen before apex; a silvery-whitish oblique strigula surrounded with blackish-fuscous crosssing apex, partly in costal cilia: cilia grey, round apex whitish, with a short dark fuscous subbasal mark opposite apex, and two bars beneath apex. Hindwings and cilia rather dark grey, with violet reflections.

N. Coorg, at 3,500 feet, in January (Newcome); one specimen. Allied to the Australian *didymella*.

*Acrocercops gemoniella*, Staint.

Having now obtained genuine examples of this species, I find that the insect previously recorded by me under this name is really a distinct species, which is described below; I had remarked a difference, but supposed it to be varietal (Vol. XVIII, p. 820). Larva mining blotches in leaves of Sugarcane (*Saccharum officinarum*); pupa in external oval brownish-yellow cocoon in depression on surface of leaf (Maxwell). Stainton's original type was bred, but from an unknown plant.

*Acrocercops præclusa*, n. sp.

♂ ♀. 7-8 mm. Head silvery-white. Palpi slender, white. Thorax white, patagia ochreous-bronzy. Abdomen grey, beneath whitish. Forewings very narrowly elongate, parallel-sided, moderately pointed; bronzy-ochreous; a narrow white dorsal stripe from base to tornus, posterior third expanded into a semioval dilation reaching half across wing, edge otherwise straight; a somewhat oblique free white strigula from costa directed towards extremity of this; a broad white præapical fascia narrowed towards costa, adjoining a black apical dot: cilia pale grey, round apex white, at apex with a short black subbasal hook. Hindwings grey; cilia pale ochreous-grey.

Maskeliya, Ceylon, in March and April (Pole); N. Coorg, at 3,500 feet, in October (Newcome); six specimens. Formerly recorded as *gemoniella*, from which it differs by absence of median prominence of dorsal streak and dorsal dot of groundcolour beneath it, also by præapical fascia fully reaching costa in moderate breadth, whereas in *gemoniella* it is rounded off above so as hardly to reach it.

*Acrocercops syngramma*, n. sp.

♂. 7 mm. Head white, face pale grey. Palpi slender, white. Thorax white, patagia bronzy. Abdomen grey, apex dark fuscous, ventral surface white, segmental margins dark fuscous. Forewings extremely narrowly elongate-lanceolate; bronzy-fuscous; a moderate white streak along dorsum from base to tornus, its posterior fourth forming a semioval dilation reaching $\frac{2}{3}$ across wing, edge otherwise straight; a somewhat oblique white strigual from $\frac{3}{4}$ of costa, running into a subtriangular white præapical fascia whose apex narrowly reaches costa, limiting a black apical dot: cilia grey, round apex white, with a grey bar below apex, and a black subbasal hook at apex. Hindwings rather dark grey; cilia grey.

Karwar, Kanara, bred in July (Maxwell); two specimens. Larva mining a compact blotch in leaves of Mango (*Mangifera indica*); pupa in a detached oval brownish-yellow cocoon on surface of leaf (Maxwell). The species is very similar to *præclusa*, but differs by the costal strigula running into præapical fascia, and conspicuous dark apex of abdomen.

*Acrocercops vanula*, Meyr.

Larva mining large blotches in leaves of *Terminalia tomentosa* (*Combretaceæ*); pupa yellowish, in large oval cream-coloured cocoon spun usually on vein inside the mine, the cuticle subsequently peeling off and leaving the cocoon exposed; this seems the normal arrangement, but in captivity the larva sometimes makes an external cocoon in a recess on surface of leaf (Maxwell). Mr. Maxwell writes "The imago is peculiar in that whenever observed, even while at rest, it has been found to stand high on its legs quivering continuously; I have bred it frequently at different times for two years, and this characteristic is always present, though not noticed in any other *Acrocercops*."

*Acrocercops elaphopa*, n. sp.

♂. 7 mm. Head and thorax light grey. Palpi slender, whitish. Abdomen grey, segmental margins white beneath, apex dark fuscous. Forewings very narrowly elongate-lanceolate; glossy grey, darker towards apex; costal and dorsal transverse whitish strigulæ at $\frac{4}{5}$, almost meeting; a round black apical spot, finely edged with whitish: cilia light grey, round apex with a subbasal dark fuscous line preceded and followed by whitish. Hindwings rather dark grey; cilia light grey, with faint purple tinge.

Karwar, Kanara, bred in July (Maxwell); one specimen. Bred from an external oval cocoon on depressed vein on surface of leaf of "Total" creeper; identification of plant promised later (Maxwell). Allied to *sauropis*.

*Acrocercops citrodora*, n. sp.

♂. 8 mm. Head and thorax whitish-yellow, patagia rather dark fuscous. Palpi slender, whitish, apex of second joint and a submedian ring of terminal joint fuscous. Forewings very narrow, elongate-lanceolate; dark fuscous; a whitish-yellow streak along dorsum from base to $\frac{2}{3}$ of wing, its upper edge forming two oblique wedge-shaped projections; a yellow-whitish dot in disc just beyond this; a flattened-triangular whitish-yellow spot extending along dorsum from middle of wing to tornus, emitting posteriorly a fine oblique strigula towards apex of wing; apex of wing chestnut-brown, preceded by a spot of blackish suffusion which is edged anteriorly by silvery-white costal and terminal dots: cilia rather dark grey, round apex with base purple-white edged by a dark purple-fuscous line. Hindwings dark grey; cilia rather dark grey.

N. Coorg, at 3,500 feet, in January (Newcome); one specimen. Perhaps allied to *telearcha*, but very distinct.

*Acrocercops barringtoniella*, Dev.

Bred by Mr. Maxwell from larvæ mining blotches in leaves of *Careya arborea* (*Lecythidaceæ*); has been reared previously from *Barringtonia*, which belongs to the same natural order.

*Acrocercops austeropa*, n. sp.

♂. 9 mm. Head ochreous-grey-whitish. Palpi with second joint broadly tufted with long ochreous-grey-whitish hairs, blotched with blackish, terminal joint whitish with two blackish rings. Thorax greyish spotted with dark fuscous. Abdomen grey, beneath whitish, with lateral series of oblique black bars. Forewings very narrow, elongate-lanceolate; dark fuscous, irrorated with whitish points; a suffused blackish dot towards dorsum at $\frac{1}{3}$, followed by an oblique mark of whitish suffusion; an undefined oblique blackish streak from middle of costa, reaching $\frac{2}{3}$ across wing, lower portion edged with whitish anteriorly; two shorter oblique blackish streaks from costa posteriorly, and one inwardly oblique before apex; a dot of dark suffusion on tornus, edged above with whitish; an indistinct fine blue-leaden line crossing wing towards apex: cilia grey, round apex with black subbasal line and some series of blackish points. Hindwings dark grey; cilia grey.

Supa, Kanara, bred in May (Maxwell); one specimen. Larva feeding on "Akri" (Maxwell); the cocoon (forwarded) is very flat, oval, attached to surface of leaf, whitish-ochreous, with four scattered bubbles on its surface, apparently similar to those on the cocoon of *Epicephala chalybacma.* Allied to *patricia*; tuft of palpi unusually long.

*Acrocercops scenias*, n. sp.

♀. 7 mm. Head white, crown mixed with dark fuscous. (Labial palpi broken.) Thorax white mixed with dark fuscous. Abdomen fuscous, beneath white, with lateral series of oblique black bars. Forewings extremely narrowly elongate-lanceolate; brown irregularly mixed with black; four triangular white dorsal blotches reaching costa except fourth, their dorsal edge mixed with brown and strigulated with black, first two confluent dorsally and extending from base to $\frac{2}{5}$ of wing, third beyond middle, just touching second and fourth, fourth tornal; costa from second to apex dotted with white; a blackish dash above posterior edge of fourth; a small white spot on termen towards apex: cilia grey, round apex white with dark fuscous line. Hindwings rather dark grey; cilia grey.

Karwar, Kanara, bred in June (Maxwell); one specimen. Larva bright green, mining galleries in leaves of "Changana" bush, many larvæ in each leaf; pupa long, green, in oval white transparent cocoon on depressed vein of leaf (Maxwell). Allied to *telestis*.

*Stomphastis plectica*, Meyr.

Larva mining blotches in leaves of *Sebastiana chamælea* (*Euphorbiaceæ*); pupa in detached oval white cocoon in depression on top of leaf, preferring the extreme tip (Maxwell). This insect occurs also in South Africa.

*Cyphosticha pterocola*, n. sp.

♂ ♀. 9 mm. Head whitish, face ochreous-tinged, sides of forehead marked with dark fuscous. Palpi slender, whitish, second and terminal joints each with two bands of dark fuscous irroration. Thorax white, patagia ochreous-grey sprinkled with dark fuscous. Abdomen dark grey. Middle tibiæ and tarsi thickened with dense scales, dark fuscous, with whitish band before apex of tarsi; posterior tibiæ dark fuscous, apex white, tarsi white, three basal joints with blackish apical bands and projections of rough scales above. Forewings very narrowly elongate-lanceolate, purple-greyish-ochreous irrorated with dark fuscous; an irregular-edged attenuated white streak running along dorsum from base to about tornus, marked with some minute scattered brownish strigulæ: cilia grey, round apex whitish-grey with violet reflections and three dark grey lines. Hindwings dark grey; cilia grey.

N. Coorg, at 3,500 feet, in January (Newcome); two specimens. A peculiar species, possibly worthy of generic separation on the tarsal characters.

*Gracilaria ariana*, n. sp.

♀. 13 mm. Head crimson-grey, face white. Palpi slender, crimson, towards apex dark fuscous. Thorax yellow, suffused with light greyish-crimson anteriorly. Abdomen grey, apex whitish. Middle tibiæ crimson, externally suffused with dark grey, tarsi white. Forewings very narrowly elongate-lanceolate; bright clear yellow; costal edge ferruginous-tinged towards base; a narrow purple-coppery streak along dorsum from base throughout, extending at apex to costa, about $\frac{1}{3}$ of breadth of wing, marked along dorsum with a series of deep indigo-blue strigulæ: cilia light ochreous-grey, becoming violet-coppery round apex. Hindwings and cilia grey.

Pundaloya, Ceylon, in September (Green); one specimen. Allied to *isochrysa*.

## HYPONOMEUTIDÆ.

*Lycophantis*, n. g.

Head on crown with rough spreading hairs, face with appressed scales; ocelli present; tongue developed. Antennæ $\frac{4}{5}$, in ♂ simple, basal joint moderate, without pecten. Labial palpi moderately long, slightly curved, subascending, second joint with appressed scales, terminal joint as long as second, loosely scaled anteriorly, tolerably pointed. Maxillary palpi obsolete. Posterior tibiæ smooth-scaled. Forewings with 1*b* simple, 2 from before $\frac{3}{4}$ of cell, 3 from angle, 3-5 approximated, 7 and 8 stalked, 7 to termen, 11 from middle, stigmatium developed. Hindwings almost 1, lanceolate, acute, cilia $1\frac{1}{2}$; 2 remote, 4 absent, 5 and 6 approximated.

Allied to *Argyresthia.*

*Lycophantis chalcoleuca*, n. sp.

♂ ♀. 8-12 mm. Head and thorax white, face light fuscous. Palpi ochreous. Abdomen grey. Forewings elongate-lanceolate, narrow, acute; glossy purplish-bronze, variably more or less suffused with shining brassy-yellowish; costa finely dotted with white on posterior half; a broad snow-white dorsal streak, at base nearly reaching costa, gradually narrowed to a point at tornus, upper edge with a series of minute projections, towards dorsum often with some fuscous specks or strigulæ; a fine blackish terminal line marked with minute white dots: cilia light greyish-ochreous, on costa brassy-bronze. Hindwings grey; cilia light greyish-ochreous.

Khasis; from September to November, twelve specimens.

*Argyresthia semitrunca*, n. sp.

♀. 9-10 mm. Head white. Palpi white, with dark fuscous lateral line. Thorax white, with dark fuscous lateral stripe. Abdomen grey, segmental margins white. Forewings lanceolate, pointed; 7 and 8 separate; deep fuscous-purple; some white specks on costa; a strong yellowish-white dorsal streak from base to near middle, posteriorly truncate, followed by an oblong blackish spot, whence a slender posteriorly oblique blackish fascia runs to costa, blackish spots in disc at $\frac{2}{3}$ and on middle of costa; a slight whitish mark above tornus, preceded by a blackish spot; an oblique white mark on costa towards apex, preceded by blackish suffusion; some white terminal specks: cilia grey, round apex dark fuscous. Hindwings and cilia grey.

Khasis, in October, five specimens.

*Argyresthia leuculias*, n. sp.

♂ ♀. 8-9 mm. Head and palpi white. Thorax white, shoulders pale fuscous. Abdomen grey-whitish. Forewings lanceolate, pointed; 7 and 8 separate; light fuscous or whitish-fuscous, reticulated with dark fuscous, dorsal area beneath fold whitish, with some scattered dark fuscous strigulæ; small dark fuscous spots in disc at $\frac{2}{5}$ and $\frac{3}{5}$, and a dorsal spot between these; a white dash above tornus, edged anteriorly by an oblique dark fuscous strigula; a round blackish apical dot, partially edged with white: cilia grey-whitish, round apex with three dark fuscous lines. Hindwings grey, thinly scaled towards base; cilia pale grey.

Maskeliya, Ceylon, from March to June (Pole, de Mowbray); six specimens.

*Argyresthia dislocata*, n. sp.

♂ ♀. 8-9 mm. Head and palpi white. Thorax white, with a broad light fuscous humeral stripe. Abdomen grey-whitish. Forewings lanceolate, round-pointed; 7 and 8 separate; white with violet or brassy reflections, closely reticulated with dark fuscous except towards dorsum, with several fuscous strigulæ on dorsum before middle; a small dark fuscous spot on fold at $\frac{1}{4}$ of wing, and one towards costa before middle; a slender oblique dark fuscous postmedian fascia dilated dorsally into a triangular spot, sometimes narrowly interrupted beneath costa; an oblique dark fuscous striga above tornus: cilia light greyish, round apex with two dark fuscous lines. Hindwings and cilia grey.

Khasis, in April, September, and November; twelve specimens.

*Zelleria strophæa*, n. sp.

♂♀. 12-17 mm. Head and thorax white, more or less sprinkled with dark fuscous. Palpi white suffusedly irrorated with dark fuscous. Abdomen in ♂ whitish sprinkled with fuscous, in ♀ grey. Forewings elongate-lanceolate; white, more or less largely suffused with fuscous and irrorated with darker fuscous, the white ground colour appearing as some irregular markings in disc and towards apex, with scattered small black dots tending to be arranged in longitudinal series; stigmata forming small blackish spots, plical very obliquely before first discal, an additional similar spot obliquely beyond second discal towards tornus; cilia grey-whitish, round apex fuscous with a black subbasal line. Hindwings grey, in cell and towards base beneath it thinly scaled and semihyaline, upper and lower margins of cell dark fuscous; cilia light fuscous.

Maskeliya, Namunukuli (6,000 feet), Puttalam, Ceylon, from September to February, and in June (Pole, Green); eleven specimens.

*Paradoxus*, Staint.

Stainton has misapprehended the structure of the palpi of this genus, and I am not aware that his error has been corrected; the joints of the labial palpi which he describes as basal and second are really the second and third, and their structure is as in *Xyrosaris*, from which this genus differs by having the antennæ shorter than the forewings.

*Paradoxus deformis*, n. sp.

♀. 13 mm. Head white, sprinkled with grey specks. Palpi moderate (shorter than in *osyridella*), white irrorated with dark grey specks except towards apex. Thorax whitish mixed with grey. Abdomen grey, anal segment whitish edged laterally with blackish. Forewings elongate, narrow, costa gently arched, bent somewhat before middle, apex obtuse-pointed, termen extremely oblique, hardly sinuate; pale greyish, finely darker-sprinkled, base somewhat darker-suffused; about forty small black somewhat raised dots scattered over wing; a moderately large semicircular suffused blackish spot on dorsum before middle of wing: cilia commencing abruptly near before apex of wing, grey, round apex suffused with dark grey, with an interrupted black basal line. Hindwings rather dark grey, without hyaline patch; cilia grey.

Kegalle, Ceylon (Alston); one specimen.

*Xyrosaris campsiptila*, n. sp.

♂♀. 12 mm. Head and thorax pale brownish, mixed with whitish and finely sprinkled with dark fuscous. Palpi whitish-brownish, irrorated with dark fuscous. Abdomen in ♂ ochreous-grey-whitish, in ♀ grey, segmental margins whitish. Forewings elongate, narrow, widest at $\frac{1}{3}$, costa gently arched, apex pointed, termen sinuate, extremely oblique; pale brownish, finely sprinkled with dark fuscous specks, and strewn with short straight transverse whitish strigæ, and with scattered minute black raised dots and strigulæ; obscure patches of fuscous suffusion on middle of costa, and on dorsum at $\frac{1}{3}$ and $\frac{2}{3}$; an angulated transverse series of several small blackish tufts before apex: cilia pale brownish, on termen with rows of black points and an interrupted dark fuscous subbasal shade. Hindwings grey; cell, and an elongate patch beneath it towards base, hyaline but thinly strewn with grey hairs; cilia light ochreous-grey.

Puttalam, Ceylon, in November (Pole); N. Coorg, 3,500 feet, in May (Newcome); three specimens.

*Prays erebitis*, n. sp.

♂. 12-13 mm. Head and thorax fuscous, face sometimes whitish. Palpi fuscous, extreme base and apex of terminal joint whitish. Abdomen dark-grey. Forewings elongate, narrow, costa slightly arched, apex pointed, termen extremely obliquely rounded; fuscous, strigulated throughout with dark fuscous, obscurely dotted with whitish between the strigulæ in disc and towards termen; a very undefined oblique darker fuscous fascia from middle of dorsum to middle of costa, extended along costa as an undefined patch to $\frac{3}{4}$: cilia fuscous, indistinctly mixed with whitish on two terminal bars. Hindwings pointed; rather dark fuscous, thinly scaled and iridescent on basal half; cilia fuscous.

Ootacamund, in December (Fletcher); two specimens.

*Prays citri*, Mill.

Madulsima, Maskeliya, Colombo, Ceylon (Pole, Mackwood, Green); N. Coorg, 3,500 feet (Newcome); from January to May. An injurious pest of the orange and other species of *Citrus*, the larva feeding in the shoots; it has been recorded from Southern Europe and Australia (*nephelomima*, Meyr., is a synonym), and Mr. S. Busck has sent me for identification a specimen from the Philippines; it is doubtless artificially spread with its foodplant.

*Prays ducalis*, n. sp.

♀. 16 mm. Head and thorax grey slightly mixed with whitish. Palpi and abdomen grey. Forewings elongate, narrow, costa gently arched, apex obtuse-pointed, termen slightly rounded, rather strongly oblique; white, strewn throughout with small dark fuscous spots and strigulæ, these dark markings are suffused together with fuscous to form irregular elongate patches extending along costa from base to $\frac{3}{4}$ and along dorsum from base to tornus, confluent near base and connected by a narrow oblique dark fuscous bar near middle of wing, beyond which the costal patch is expanded with dark fuscous suffusion reaching half across wing, and marked above this with obscure whitish suffusion on costa; cilia brownish with obscure whitish bars below apex and above tornus, at apex dark fuscous on basal half, on costa alternately light brownish and whitish. Hindwings tolerably pointed, not acute; grey, rather lighter and iridescent towards base; cilia grey.

Namunukuli, Ceylon, over 6,000 feet, in February (Green); one specimen.

*Prays curulis*, n. sp.

♀. 13 mm. Head grey, lower part of face white. Palpi grey, apex of joints whitish. Thorax grey, posterior extremity and apex of patagia white. Forewings elongate, narrow (rather less narrow than in *ducalis*), costa slightly arched, apex tolerably pointed, termen very obliquely rounded; white irregularly spotted with grey; irregular elongate patches of grey suffusion transversely marked with dark fuscous extending along costa from base to $\frac{3}{4}$ and along dorsum from base to tornus, connected by an oblique rather broad median fascia, mixed with blackish; apical area marked with several small dark fuscous spots: cilia grey suffused with coppery, towards base mixed with white and blackish, on costa white with a grey spot. Hindwings pointed; grey, rather thinly scaled and iridescent on basal half; cilia grey.

Khasis, in September; one specimen.

*Prays acmonias*, n. sp.

♀. 12-13 mm. Head bronzy-grey mixed with whitish. Palpi grey. Thorax dark ashy-grey, posteriorly whitish. Abdomen grey. Forewings elongate, rather narrow, costa anteriorly straight, posteriorly gently arched, apex tolerably pointed, termen slightly rounded, rather strongly oblique; white; some grey markings towards base of costa, and a patch of more or less developed grey marbling and suffusion extending along costa from $\frac{1}{5}$ to $\frac{3}{4}$; some small grey spots or suffusion on dorsum before middle; a transverse dark grey blackish-mixed blotch on dorsum beyond middle, confluent above with costal patch; a triangular dark grey tornal spot mixed with blackish; a small suffused blackish apical spot; three small blackish spots suffused together with dark grey occupying median portion of termen: cilia dark bronzy-grey, on basal half mixed with white. Hindwings tolerably pointed, not acute; rather dark fuscous, thinly scaled and semihyaline on anterior half; cilia grey.

Rawalpindi (Manders); two specimens.

*Diaphragmistis*, n. g.

Head with appressed scales, sidetufts expanded anteriorly over base of antennæ; ocelli present; tongue short. Antennæ $\frac{4}{5}$, in ♂ simple, basal joint moderate, rather dilated, with strong pecten. Labial palpi moderate, slightly curved, subascending, with appressed scales, terminal joint somewhat longer than second, pointed. Maxillary palpi minute, drooping. Posterior tibiæ with appressed scales. Forewings with cell long, 2 from angle, 3 absent, 4 absent, 7 to termen, 8-10 rather near together, 11 from $\frac{1}{4}$. Hindwings almost 1, ovate-lanceolate, cilia 1; cell short and distorted, less than half wing, 2 from towards angle, curved near base, 3 from angle, 4 absent, 5 and 6 stalked, rising from near angle, 7 from angle, curved.

A development of *Hyponomeuta*.

*Diaphragmistis macroglena*, n. sp.

♂. 15 mm. Head white, crown with two small fuscous spots between antennæ. Palpi whitish. Thorax ochreous-whitish, with some groups of fuscous specks. Abdomen light grey, apex whitish. Forewings elongate, narrow, costa moderately arched, apex obtuse-pointed, termen extremely obliquely rounded; whitish, irregularly strigulated throughout with brownish, more closely and suffusedly towards costa posteriorly, with scattered blackish-fuscous scales and minute dots: cilia whitish, round apex with rows of blackish points and two black lines. Hindwings light grey; an elongate hyaline patch beneath cell, reaching from base to $\frac{1}{3}$ of wing, including posteriorly a black thickened glandular elongate mark; cilia light grey.

Khasis, in November; one specimen. The black mark of hindwings may probably be sexual.

*Orthosaris*, n. g.

Head shortly rough-scaled; tongue short. Antennæ $\frac{4}{5}$, in ♂ simple, basal joint moderate, with pecten. Labial palpi moderate, straight, subascending, second joint with appressed scales, terminal joint longer than second, thickened with scales becoming loosely expanded into an apical brush. Maxillary palpi rudimentary. Posterior tibiæ with appressed scales. Forewings with cell long, 2 from very near angle, 3 from angle, 4 absent, 5 approximated, 7 to termen, 8-10 near together, 11 from $\frac{1}{3}$. Hindwings 1, trapezoidal-ovate, cilia $\frac{3}{4}$; 2 moderately remote, parallel, 3 from angle, 4 absent, 5-7 slightly approximated towards base.

Also a development of *Hyponomeuta*.

*Orthosaris strictulata*, n. sp.

♂. 12 mm. Head white, face finely irrorated with fuscous. Palpi whitish finely irrorated with fuscous. Thorax whitish irrorated with dark fuscous. (Abdomen broken.) Forewings elongate, posteriorly slightly dilated, costa gently arched, more strongly posteriorly, apex tolerably pointed, termen slightly sinuate, somewhat oblique; whitish-fuscous, finely sprinkled with dark fuscous, and strewn throughout with short straight transverse whitish strigæ; an irregular series of several black dots near before apex and termen: cilia whitish-fuscous, base white, limited by a row of black points. Hindwings rather dark grey, lighter anteriorly; a hyaline elongate patch beneath cell from base to $\frac{1}{3}$ of wing; cilia whitish-grey.

Matale Ceylon, in August (Pole); one specimen.

*Hyponomeuta prætincta*, n. sp.

♂ ♀. 14-16 mm. Head white, crown with two blackish dots. Palpi white, laterally mixed with dark grey except towards apex of joints. Thorax white, with a transverse median series of four small black spots. Abdomen grey. Forewings elongate, very narrow, costa slightly arched, apex obtuse-pointed, termen extremely obliquely rounded; whitish, more or less strigulated with grey and suffused with light grey, especially in disc posteriorly; an almost costal row of about seven black dots from base to near middle, a subcostal row of about eight from before middle to apex, a row of about ten above fold throughout, and a subdorsal row of about nine from base to $\frac{2}{3}$; a spot of dark purple-fuscous suffusion in disc near base, and a larger irregular patch in disc at $\frac{2}{5}$; apex of wing tinged with purplish: cilia grey, with a white spot on costa towards apex and a whitish tornal patch, between these tinged with purplish, with three blackish lines. Hindwings grey, thinly scaled and semihyaline near base; cilia grey.

Khasis, in October and November; four specimens.

*Hyponomeuta calculosa*, n. sp.

♂ ♀. 14-17 mm. Head whitish-ochreous, face sometimes tinged with grey. Palpi whitish-ochreous, laterally suffused with grey. Thorax light ochreous-grey. Abdomen whitish-ochreous tinged with grey. Forewings elongate, narrow, costa gently arched, apex obtuse, termen straight, rather oblique; rather glossy greyish-ochreous, with a few small scattered very obscure dark grey dots on veins, sometimes almost obsolete; a large blackish dot towards dorsum before middle: cilia light greyish-ochreous, with a spot of dark grey suffusion above apex, and a dark fuscous patch formed by confluence of a median shade on upper third of termen with an apical shade on median third. Hindwings light grey, thinly scaled and semihyaline near base; cilia pale greyish-ochreous.

Khasis, in October and November; fourteen specimens.

*Hyponomeuta corusca*, n. sp.

♀. 18 mm. Head ochreous-whitish, face greyish, crown with two blackish dots. Palpi loosely scaled towards apex, ochreous-whitish suffused with fuscous anteriorly and on second joint laterally. Thorax whitish-ochreous suffused with fuscous on posterior half of dorsum and towards anterior margin. Abdomen grey. Forewings elongate, costa slightly arched, apex tolerably pointed, termen nearly straight, rather oblique: glossy light bronzy-ochreous, on costal and submedian areas with longitudinal lines of irregular dark fuscous dots and small spots separated by white interspaces; disc occupied by an irregularly sinuate streak of bronzy-fuscous suffusion from base to middle: cilia pale bronzy-ochreous. Hindwings grey, rather thinly scaled near base; cilia whitish-ochreous, towards base suffused with light grey.

Khasis, in August; one specimen.

*Nosymna lapillata*, n. sp.

♀. 50 mm. Head ochreous-whitish. Antennæ simple, shortly ciliated. Palpi shorter and stouter than in *punctata*, blackish-grey, second joint ochreous-whitish on lower longitudinal half. Thorax ochreous-whitish, with small dark bluish-grey spots on shoulders and on each side posteriorly. Abdomen grey-whitish. Forewings elongate, costa gently arched, apex rounded-obtuse, termen rounded, rather oblique; ochreous-white, with irregularly scattered indigo-blackish-grey dots, several of these coalescing irregularly in disc; costa indigo-blackish-grey towards base: cilia ochreous-white. Hindwings and cilia ochreous-grey-whitish.

Darjiling, in March; one specimen. A second from Sikkim is probably the same species, but has palpi whitish-ochreous, thorax apparently without dark dots. From the above species *punctata* differs by pectinated antennæ, *repletella* by barred cilia of forewings, *stipella* by dark grey hindwings.

*Anticrates decaplaca*, n. sp.

♀. 16 mm. Head yellow, neck and sides of face crimson-red. Palpi crimson, terminal joint yellow towards apex. Thorax yellow, apex of patagia and a postmedian bar crimson-red. Abdomen dull light crimson. Forewings elongate, costa gently arched, apex obtuse, termen obliquely rounded; crimson-red, with a yellow dot beneath costa near base, a small costal spot at $\frac{4}{5}$, and ten large yellow spots, *viz.*, one in disc near base, two on costa before and beyond middle, two on dorsum before middle and at $\frac{3}{4}$, one in middle of disc, two obliquely placed in disc towards termen, one at apex and one on lower part of termen connected with it: cilia light crimson, outer half on termen light yellow. Hindwings and cilia rather light crimson.

Anuradhapura, Ceylon, in December (Mackwood); one specimen.

*Anticrates miltochorda*, n. sp.

♀. 18-19 mm. Head light yellow, neck and sides of face red. Palpi red. Thorax light yellow, shoulders and a broad curved median bow red. Abdomen light crimson-reddish. Forewings elongate, costa gently arched, apex obtuse, termen slightly rounded, oblique; vermilion-red, with fifteen more or less large light brassy-yellow spots, *viz.*, one beneath costa near base, one towards dorsum near base, one in disc beyond these, one flattened triangular on costa at $\frac{1}{3}$, one above dorsum at $\frac{1}{3}$, two placed obliquely in disc beyond these, one towards costa in middle, one triangular on dorsum beyond middle, one triangular on costa at $\frac{3}{5}$, one elongate from disc beneath this to tornus, one elongate posteriorly expanded resting on lower part of termen, one elongate resting on costa at $\frac{5}{6}$, one elongate beneath this, and one at apex: cilia vermilion-red, on termen pale yellowish on outer half. Hindwings and cilia light dull crimson-red.

Khasis, in October; two specimens.

*Anticrates venatrix*, n. sp.

♀. 21 mm. Head deep yellow, lower part of face red. Palpi red, tip pale yellow. Thorax yellow, anterior margin and an irregular postmedian bar crimson-red. Abdomen pale crimson. Forewings elongate, costa gently arched, apex obtuse, termen obliquely rounded; crimson-red, with numerous clear yellow spots, *viz.*, a dot beneath costa near base, two large confluent triangular ones on costa before and beyond middle, two obliquely placed above and below fold near base, one Z-shaped in disc before middle, one towards dorsum before middle, one triangular on dorsum at $\frac{2}{3}$, one towards dorsum beyond this, a dot in disc at $\frac{2}{3}$, a curved subterminal series of six small marks, and a series of eight small distinct spots round apex and termen: cilia crimson-red, between apex and tornus yellow on outer half. Hindwings and cilia pale crimson.

Pykara, Nilgiris, at 7,000 feet, in April (Andrewes); one specimen. Very like *lucifera*, but considerably larger, and readily separable by the eight distinct terminal spots of forewings, which in *lucifera* are reduced by confluence, and also by the confluent costal spots.

*Anticrates lucifera*, n. sp.

♂♀. 13-14 mm. Head yellow, neck crimson. Palpi crimson, terminal joint pale yellow with a crimson lateral streak except towards apex. Thorax yellow, with an angulated crimson bar behind middle. Abdomen whitish-ochreous suffused with pale crimson. Forewings elongate, costa gently arched, apex obtuse, termen obliquely rounded; 8 and 9 sometimes stalked; crimson, with numerous yellow spots, *viz.*, a small one on costa near base, two large triangular ones on costa before and beyond middle, two obliquely placed above and below fold near base, three (two upper sometimes connected) in an oblique series between postmedian costal and dorsum before middle, an oblique series of five from $\frac{4}{5}$ of costa to $\frac{2}{3}$ of dorsum (of which the two uppermost are small, two discal irregular, dorsal large, triangular), three others subterminal in disc, and a series of four small ones round apex and termen: cilia crimson, outer half yellow on termen. Hindwings and cilia light crimson.

Karwar, Kanara, bred in August (Maxwell); three specimens. Larva feeding on *Sideroxylon tomentosum* (*Sapotaceæ*); cocoons sent are semiovate, solid, apparently composed of dense silk treated with some sort of cement, attached to surface of leaf; pupa protruded in emergence through a slit at end, head and antennal sheaths coming away entire. Mr. Maxwell writes: "Larva looks exactly like cocoon, and practically the same shape; legs obscure, closely appressed to leaf together with whole undersurface; rather sluggish in habit, but walks about and is not attached to leaf in any way; head invisible. Must have some sort of covering which serves ultimately for a cocoon, but we could not make it out. Species apparently uncommon."

*Anticrates thermastris*, n. sp.

♀. 12-15 mm. Head yellow, sides of face and back of crown suffused with red. Palpi red, terminal joint pale yellowish towards apex. Thorax light yellow, with a red W-shaped bar. Abdomen dull light crimson. Forewings elongate, costa gently arched, apex obtuse, termen slightly rounded, oblique; vermilion-red, with a yellow dot beneath costa near base, and about fourteen yellow spots, *viz.*, two obliquely placed above and below fold near base, one on costa at $\frac{1}{3}$, an oblique one above dorsum at $\frac{1}{3}$, two connected to form a Z-shaped mark in disc before middle, one triangular on dorsum beyond middle, one oblique on costa at $\frac{3}{5}$, one beneath this in disc, three forming a series from $\frac{4}{5}$ of costa to tornus, one at apex, and one on lower part of termen: cilia red, outer half light yellowish except towards tornus. Hindwings and cilia dull light crimson.

Nilgiris, at 3,500 feet, in January (Andrewes); Ganesh Gudi, Kanara, in May (Maxwell); two specimens.

*Aetherastis constellata*, n. sp.

♂. 16 mm. Head, palpi, antennæ, thorax, and abdomen whitish-ochreous; antennæ moderately bipectinated; thorax with a blackish dot on each patagium, and two near posterior extremity. Forewings moderate, suboblong, costa moderately arched, apex rounded, termen rather obliquely rounded; whitish-ochreous; a basal group of five rather large blackish dots, *viz.*, one median near base, one subdorsal near base, one beneath costa at $\frac{1}{4}$, one below this beneath fold, and one in disc slightly beyond these: cilia whitish-ochreous. Hindwings pale ochreous-grey; cilia whitish-ochreous.

Wellawaya, Ceylon, in November (Green); one specimen.

*Comocritis præcolor*, n. sp.

♂. 15 mm. Head whitish-ochreous, face and palpi white. Antennal pectinations short. Thorax white, shoulders sprinkled with grey. Abdomen whitish. Forewings elongate, costa moderately arched, apex rounded, termen obliquely rounded; white; three suffused blotches of fuscous irroration, sprinkled with black specks, occupying most of disc from near base to near apex, separated only by curved white streaks, first blotch extending below fold and indistinctly to costa, second extended anteriorly to costa at $\frac{2}{5}$ and limited beneath by fold, third resting on tornus and not reaching costa; some slight dark fuscous irroration towards middle of dorsum; a narrow yellow-ochreous apical fascia attenuated downwards to middle of termen, edged anteriorly with some dark fuscous irroration. Hindwings grey; cilia white with grey subbasal line.

Trincomali, Ceylon, in November (Green); one specimen.

*Comocritis nephelista*, n. sp.

♂♀. 16-20 mm. Head and palpi white. Antennæ in ♂ flatly dentate strongly ciliated. Thorax ochreous-white, posteriorly tinged with grey.

Abdomen whitish. Forewings elongate, costa gently arched, apex rounded, termen very obliquely rounded; 9 and 10 stalked; whity-brownish irrorated with dark fuscous, more strongly posteriorly; a suffused white streak along costa from about $\frac{1}{3}$ to near apex; two small indistinct dark fuscous spots obliquely placed towards costa at $\frac{1}{4}$; a suffused whitish streak enclosing an elongate-semioval patch of stronger dark irroration along median third of dorsum; some indistinct whitish admixture in disc posteriorly, sometimes forming a suffused streak running to termen above tornus; four small indistinct cloudy dark fuscous spots round apex and termen: cilia pale whity-brownish with faint grey shades, beneath tornus whitish. Hindwings light grey; cilia white.

Kandy and Maskeliya, Ceylon, from March to June (Mackwood, Pole); four specimens. Differs from the rest of the genus by stalking of 9 and 10 of forewings.

*Comocritis enneora*, n. sp.

♂. 17 mm. Head and palpi white. Antennal pectinations very short. Thorax white, with two small dark grey postmedian spots. Forewings elongate, costa gently arched, apex rounded, termen rounded, rather strongly oblique; 3 and 4 connate; silvery-white; nine small roundish dark leaden-grey spots, *viz.*, one almost basal beneath costa, one in disc towards base, one towards costa before $\frac{1}{3}$, one on fold beneath this, one elongate in disc before middle, one above middle of disc, one on fold beyond middle, one towards costa before $\frac{2}{3}$, and one in disc beyond this: cilia white, base pale ochreous. Hindwings grey-whitish; cilia white.

Khasis, in May; one specimen. This example has the pupal case, with the head and lingual and antennal sheaths separated in one piece, still enclosing the abdomen.

*Ethmia duplicata*, n. sp.

♂ ♀. 30-32 mm. Differs from *hilarella* only as follows: abdomen with dorsal spots absent on two basal segments, reduced or absent on third; hindwings in both sexes as in *hilarella* ♀, but with apical patch wider and much more convex anteriorly, less produced beneath and not reaching middle of termen, grey apical patch in cilia also reduced and not reaching middle of termen. The characters of abdomen are as in *pullata*, but in that species the hindwings have a dark fuscous costal band on lower surface.

Patipola (6,200 feet), Maskeliya, Puttalam, Ceylon, in December and January (Pole, Fletcher); three specimens. Doubtless sometimes overlooked by collectors and mistaken for the commoner *hilarella*.

# PROGRESS OF THE MAMMAL SURVEY.

Since the 31st March when the last report appeared, Mr. Crump has arrived in Behar and Orissa and the thanks of the Society are due to H. H. Sir Chas. S. Bayley, the Lieutenant-Governor of the Province, for having issued orders which have helped our Collector. Mr. Crump arrived in Daltongunj from Philibit in March and at once started work. He did not find much suitable ground there so soon left for Hazaribagh District where he still is. Unfortunately he had a severe sunstroke early in May, but he writes now that he is better and gradually resuming work. It is hoped to send him to Orissa shortly.

The reason that Mr. Crump was sent to Palamau and Hazaribagh districts was because the original types of certain animals were obtained there towards the latter part of the eighteenth century. The country of course has changed very considerably in many ways since then and the jungle and forests have in many places disappeared.

Mr. Shortridge after working the extreme South of Burma (Victoria Point) moved to Mergui and has been for the last 2 months on the Tenasserim River. As the rains are approaching and it is impossible to do more on the coast this season, he leaves shortly for Lower Chindwin and Mount Victoria and if possible he will endeavour to collect on the Lower Sittang River (SHWEGYIN) at the close of the rainy season.—Mr. Shortridge has also suffered slightly from a recurrence of the sunstroke which he had in Australia some years ago.

The problem of working a Mammal Survey in Burma has proved to be a much more difficult task than was anticipated owing to the immense amount of country to be covered, the number of places which must be visited, the density of the jungle, the difficulty and expense of transit and the fact that the fair weather season when any collecting can be done, is so short. In consequence of this and at Mr. Shortridge's urgent request, we have agreed to engage a fourth Collector, Capt. S. A. Macmillan, to work with him. Capt. Macmillan has been on a rubber estate in Tenasserim and not only is a keen hunter after Mr. Shortridge's own heart, but possesses local knowledge of languages, &c., which will be of great value to Mr. Shortridge whilst in Burma.

Major Mayor is still in Ceylon and has been for the last few months collecting in the Anuradhapura District, but he expects to finish up shortly and come to Bombay prior to commencing collecting in Central India.

## MAMMAL FUND.

### FURTHER LIST OF SUBSCRIPTIONS UP TO 20TH MAY 1914.

| NAMES. | Amount. | | |
|---|---|---|---|
| | Rs. | A. | P. |
| Amount previously acknowledged in Journal No. 4, Vol. XXII .. .. .. .. .. | 76,760 | 5 | 2 |
| Barton, C. S. .. .. .. .. .. | 10 | 0 | 0 |
| Bayley, The Hon'ble Sir Chas. (K.C.S.I., I.C.S.) .. | 50 | 0 | 0 |
| British Museum, The Trustees of, £100 (2nd Donation) .. .. .. .. .. .. | 1,494 | 2 | 7 |
| Bury, C. H. .. .. .. .. .. .. | 29 | 12 | 0 |
| Cox, Col. Sir P. Z. (K.C.I.E., F.Z.S., F.R.G.S.) .. | 100 | 0 | 0 |
| Fleming, Major A. M. .. .. .. .. | 15 | 0 | 0 |
| Government of Burma (2nd Donation) .. .. | 3,000 | 0 | 0 |
| Hunt, Capt. A. T. (C.I.E., R.N.) .. .. .. | 15 | 10 | 0 |
| Mackenzie, J. M. D. (I.F.S.) .. .. .. | 57 | 9 | 0 |
| Mosse, Capt. A. H. E. .. .. .. .. | 50 | 0 | 0 |
| Robinson, H. C. .. .. .. .. .. | 28 | 4 | 0 |
| Stables, Major A. .. .. .. .. .. | 30 | 0 | 0 |
| Tata, Ratan (2nd Donation) .. .. .. | 1,000 | 0 | 0 |
| Ware, F. .. .. .. .. .. .. | 10 | 0 | 0 |
| Whitehead, Capt. C. H. T. .. .. .. | 25 | 0 | 0 |
| Wilson, Capt. A. T. .. .. .. .. .. | 50 | 0 | 0 |
| Rs. .. | 80,725 | 10 | 9 |
| *Promised.* | | | |
| Government of Federated Malay States (2nd Donation) .. .. Rs. 1,750 }<br>Royal Society. £10 (2nd Donation) .. } | .... | .. | .. |
| Interest credited by the Bank .. .. .. | 36 | 15 | 10 |
| Total Rs. .. | 80,762 | 10 | 7 |

# A PRELIMINARY ACCOUNT OF THE COCCIDÆ OF WESTERN INDIA.

BY

RAMRAO S. KASARGODE.

The coccidæ of Western India are a group of insects which have been very little collected and about which in this area very little is known. When one compares the enormous mass of information about them as they occur in Ceylon, which has been collected about them by Mr. E. E. Green, and the considerable amount of knowledge which we have of them in North-East India, particularly as they occur in tea, the paucity of knowledge as regards them in Western India is the more remarkable. And this lack of information is not because of any lack of importance. The scale insects have proved themselves among the worst of agricultural pests, and particularly pests of fruit trees. Although they are not so obvious in Western India as in some other parts even of India, yet they occur abundantly on many fruit trees. The mango tree alone has revealed a number of species living upon it and upon the Loranthus (*bandgul*) parasite which is always associated with it. They are very common on the fruit of the betel-nut palm—one of the most valuable of our fruit trees. They constantly occur on various citrus fruits, and in at least one case form a serious pest. And there are many others. All these are at present perhaps not very obvious, but there is no group of insects whose existence should be watched with a more jealous eye, as they spread when the conditions are favourable with marvellous rapidity, and what was an entomological curiosity belonging to the group of scale insects, has on several occasions in the history of agriculture, become in a few years a public menace.

The cause of the lack of attention devoted to scale insects in Western India has been probably the small amount of attention devoted to the growth of perennial crops like trees and shrubs. Most agriculture is that of annual crops, while the scale insects are peculiarly the pests of such plants as stand from year to year. Fruit culture is now increasing in importance: with this increase, the danger of these pests, and the interest they will evoke will undoubtedly increase.

A word of explanation will not be out of place in connection with the growth of individual species to the magnitude of pests. Most of the species except a few are quite harmless and are for the present only entomological curiosities. Mainly this is due to the inter-relation of parasitic and predacious insects on the one hand and scale insects on the other. The balance of life which now exists between the two classes of insects, one preying upon the other, may be disturbed in many ways. Cutting and clearing large mixed forest growth and establishing either tea or coffee has, for instance, enabled the tea and coffee pests to breed and multiply to such numbers that we recognize them as serious pests.

The following is an account of such species which I have been able to collect in Western India up to the present. The identifications have been made or confirmed in each case, with very great kindness, by Mr. E. E. Green, late of Ceylon.

## Sub-family—DIASPINÆ.

*Aspidiotus destructor*, Sign.—This coccid has so far been only found on the mango tree (*Mangifera indica*), but practically every mango tree I have examined showed this scale to a greater or less extent. In many cases the scales fully covered the tender young branches and leaves. The upper as well as the lower surfaces of leaves harbour the species. In gardens devoted to mango growing individual trees only here and there, are seriously affected, while the remainder are hardly attacked at all. I should nevertheless count it as a serious pest of the mango tree in Western India. It occurs commonly where mango trees are grown, and I have collected it in almost every district. It has been recorded also by I. H. Burkill on Mango trees at Nadiad (Gujarat*).

This species has been recorded as extremely destructive to cocoanut trees in the Laccadive Islands (Cotes)† but I have not noticed it on these trees on the West Coast of India.

*Aspidiotus ficus*, Ashm.—This scale is distributed almost all over the area we are discussing, and though mainly found on palms, it can feed on a large number of other plants.

I have received it, for instance, as a serious pest of citrus trees near Khed in the Poona District. The fruits in this case were simply covered by the scales. The insect was first described and determined from specimens collected on orange trees at Poona by Woodrow. It does not seem to be a serious pest, even in the same orchard every year, but is certainly one of the most dangerous pests to have on the trees. In other parts of India it does much damage to young orange trees, and orange growers in America have often been specially warned against it.

The insect is also found on the tree *Garcinia indica*, a plant allied to the mangosteen which grows in the Konkan. In this case it was closely associated with two or three other scales,—*Vinsonia stellifera*, Westw; *Parlatoria proteus*, Curtis, and a species of *Fiorinia*.

But the main habitat of the species is undoubtedly palm trees. Ornamental palms in botanic gardens in Poona are subject to serious attack. Betel-nut palms at Sirsi in the Kanara district were found to be attacked. And it has been collected on *Areca catechu* in Bombay by I. H. Burkill.‡

*Aspidiotus lataniae*, Sign.—This insect has been obtained from three distinct food plants, the bamboo, the *Citrus medica*, and the *gul mohur* (*Poinciana regia*). On bamboos it attacks both the leaves and the stem to the height of a few feet from the ground. On *Citrus medica*, a common Konkan fruit, the fruits only were attacked, there was no trace of the scale on the leaves or stems.

*Aspidiotus rosei*, Mask.—This scale has not previously been noticed in India to my knowledge. It is not mentioned in Mr. Green's list of Indian Coccids (Memoirs of the Department of Agriculture in India, Entomological Series, Vol. II, No. 2). It was found on the leaves of *Barringtonia acutangula* at Poona.

*Aspidiotus orientalis*, Newstead.—This coccid occurs on roses in many localities in the Deccan, being found both in Poona and Ahmednagar. It is fairly common on old rose trees in many gardens, and especially attacks the stems, sometimes killing the rose bushes. It would seem to be a pest chiefly of neglected and non-vigorous plants. It has been recorded on *Cycas revoluta* in Calcutta and on many other plants, such as *Dalbergia* and *Tamarindus*, but I have not observed it on these plants in Western India.

*Aspidiotus curcumae*, n. sp.—This is a species probably new to India named as above by Mr. E. E. Green, who will publish a technical description of it. It is found on an important crop, namely, turmeric. The plants above ground are free from the insect, but the rhizomes were covered with them. As the plants are propagated by means of the rhizomes, they are easily distributed by this means, and it would be a very difficult pest to control. It was discovered quite accidentally when examining the rhizomes for another fly pest.

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* Memoirs of the Department of Agriculture in India. (Entomological Series) Vol. II, No. 2.

† Indian Museum Notes, Vol. II., page 188.

‡ l. c.

*Chionaspis dilatata*, Green.—There are few scale insects more common than this on mango and banyan trees in Poona, where it occurs on both the upper and lower surfaces of the leaves. The females are rarely found, and when found they are always on the lower surface. The insect is known on palms in Calcutta, but its occurrence in Western India has not previously been noted.

*Chionaspis decurvata*, Green.—This scale occurs on bamboos in Poona, and so far has been noticed on no other plant. It was first described by Mr. Green from specimens occurring on rice from Calcutta.

*Hemichionaspis aspidistræ*, Sign.—This insect was first noticed on the *Loranthus* which so commonly attacks the mango tree (*bandgul*). It never occurs on the mango tree itself. It is also found occasionally on the banyan tree.

*Parlatoria proteus*, Curtis.—Has already been mentioned as occurring along with *Aspidiotus ficus* on the tree *Garcinia indica* in the Konkan.

Another species of *Parlatoria* has been found on *Michelia champaca* which Mr. Green thinks is likely to be a new species.

*Fiorinia frontecontracta*, n. sp.—This occurs on *Garcinia indica* along with *Aspidiotus ficus*, *Parlatoria proteus* and *Vinsonia stellifera* It has been provisionally named as above by Mr. Green, who will publish a technical description of it.

*Fiorinia sapindi*, n. sp.—Is another species of *Fiorinia* occurring on *Sapindus trifoliatus* described as new by Mr. Green.

*Diaspis echinocacti*, Bouche.—Occurs as a fairly common parasite of *Opuntia* (prickly pear) in Western India, and when the attack is serious it covers all the green parts of the stem. It has been noticed on *Loranthus* from Tanjore (Madras), but not on this plant in Bombay.

*Diaspis barberi*, Green.—Is a species very closely related to the last, and this *does* occur on the leaves of *Loranthus* in Poona.

*Leucaspis indica*, Marlatt.—This scale occurs commonly on mango trees, but does not seem to have been noticed in India previously. It was first identified in America on mango saplings introduced from India. The scales are completely hidden under the black mould so common in connection with scale insects but under this covering the scales completely encircle the tender branches. It may become a serious pest if not carefully watched.

### Sub-family.—Lecaniinæ.

*Lecanium hemisphericum*, Sign.—This is one of the most widely distributed scale insects in the tropics and is the famous 'brown bug' of coffee. In Western India, it was first observed in an ill-kept garden, infesting crotons of many kinds. The way it covered the stems, leaves and tender branches showed it to be very destructive in this case, and the plants were in a dying condition. The plants were treated by severe pruning and burning all the prunings covered with the pest.

The same insect was found infesting vines of *Coccinia indica* at Thana. It is also a somewhat serious pest of *pomelo* plants in the Konkan, where it was found by Dr. H. H. Mann doing very considerable damage at Rajapur in the Ratnagiri district.

*Lecanium nigrum*, Nietner.—Is a black scale found in Poona and the neighbourhood on *Canna*, the castor plant and many others. Though it seems to have a large number of food plants, I have not come across it as a pest of any importance. It is curious to know that it has been found on cotton at Pusa (Behar).

*Ceroplastes actiniformis*, Green.—This insect, which has never been noticed in India before, has been found on the *Loranthus* attacking mango trees in the neighbourhood of Poona and also on the banyan tree. The scales are found singly distributed on the tender stems at the axils or on the midribs of the leaves.

*Ceroplastes rubens*, Maskell.—Has been noticed to occur attacking an unidentified fern in a nursery at Poona. The scales were all arranged in a row on the upper surface near the midrib of the fronds.

*Pulvinaria psidii*, Mask.—Has been found on many plants, among them being the mango tree, the guava tree and the tree *Bassia latifolia*. It is a bad pest on guavas. In this case the whole tree is covered by what has been happily described as "drops of white paint." The tree is recognisable from a distance by these white specks and also from the black mould which covers the leaves and tender branches. The scale attacks the green parts seriously and covers them completely. During the off season, the scales remain hidden under loose bark or knotty growths on the stem.

*Vinsonia stellifera*, Westw.—Was found in large numbers on the leaves of *Garcinia indica* in Bombay. I have not found it on any other plants in Western India though it occurs on many in Ceylon.

### Sub-family—DACTYLOPIINÆ.

*Dactylopius virgatus*, Kkll.—Is an extremely common species found in almost all gardens in the neighbourhood of Poona attacking crotons. It is, in fact, a regular pest on these plants especially when they are planted close together. The scales spoil the appearance of the leaves, which become distorted and sickly in appearance.

It has also been collected on the adventitious roots of banyan trees by Dr. H. H. Mann near Poona. In this case it was found in no other part of the tree not even on the leaves, but on these adventitious roots, it was very common indeed.

*Dactylopius nipai*, Mask.—This species occurs on scattered plants of *Cajanus indicus* (*arhar* or *tur*). It apparently does litttle serious injury as only a very few of the plants had these scales crowded round the growing tip of the plant, in which position it is fatal. This species is said to be a pest on stored potatoes in Bengal, but I have never seen it on potatoes in Western India.

*Phenacoccus hirsutus*, Green.—This scale was collected by Dr. H. H. Mann on the banyan (*Ficus bengalensis*) at Mohol in the Sholapur district of the Deccan. It occurred like *Dactylopius virgatus* only on these roots.

Other very similar scales, not yet completely identified, have been found near the axils of the leaves of *banyan* trees in Poona.

*Antonina anceps*, n. sp.—Has been provisionally named by Mr. Green from a few specimens I collected from under the sheathing leaves of a reed bamboo. The scales were found crowded together in the axils, and some were seriously distorted in shape on account of the number of them occupying a limited space within the sheathing leaf.

### Sub-family—ASTEROLECANIINŒ.

*Asterolecanium miliaris*, Borsd.—Is the only representative of this sub-family yet found in Western India. This scale was found on two ornamental bush bamboos in Poona to a very destructive extent. The scale was crowded on the undersurfaces of the leaves.

### Sub-family—MONOPHLEBINŒ.

*Icerya seychellarum*, West.—This scale is quite rare. Only a few specimens were found on mango shoots. It has not been observed on any other plants in Western India.

*Icerya aegyptiaca*, Dougl.—Is also a rare scale, but found in a few cases on the leaves of *Ficus bengalensis* (*banyan*).

This list of scale insects in Western India is only a preliminary one. Many others have been collected but they are omitted until the identification is certain and complete. The data given above has only been possible on account of the help and co-operation of Mr. E. E. Green, who has taken the greatest pains to identify the collections sent to him. I am deeply grateful to him for thus enabling me to render my observations of definite and permanent value.

# REVIEWS.

## A TEXT-BOOK OF MEDICAL ENTOMOLOGY.

BY

W. S. Patton and F. W. Cragg; Madras, Christian Literature Society, 1913. Pages xxxiii + 768; 89 Plates and 3 Text-figures. Price Rs. 15-12-0.

The study of Diseases, especially in the Tropics, of late years has shown very forcibly the highly important part played by Biting Flies, Bugs, Ticks, etc., in the dissemination of the parasitic organisms which cause such diseases, so that some knowledge of Entomology has become an absolute necessity to every medical man. The control of such diseases being as a rule brought about most simply by the control of the insects which convey them from host to host, it follows that some knowledge of the insects concerned must be an essential requisite of everyone who has to deal with cases of such diseases. Hitherto the inquirer, who has wished to acquaint himself with published information regarding the classification, structure and habits of even the commonest and most important of the numerous insects which have already been incriminated as Carriers of Disease to man and animals, has had to rely on compiling information to the best of his ability from the hundreds of text-books and papers, many of which are accessible only with great difficulty and almost all of which are published in various languages and scattered throughout periodicals and reports dealing with entomological, medical, veterinary and sanitary work. It is true that Colonel Alcock's "Entomology for Medical Officers," which appeared some two years ago, provided the first elements of knowledge on the subject, whilst text-books such as Brumpt's "Precis de Parasitologie" have included a short resumé of the groups of disease-carrying Arthropods, but the text-book now under review furnishes the first—and up to date the only tolerably complete—general account of the groups in question, dealing especially with the internal anatomy of the various families, a point of considerable importance to the isolated student who is thrown upon his own resources to investigate the problems of the transmission of pathogenic organisms.

This Text-book is divided into twelve chapters, the first ten of which deal with the general anatomy and physiology of the blood-sucking Diptera, the classification, structure and bionomics of the various groups of these flies and of the fleas, bugs, lice, ticks, linguatulids and water-fleas; whilst the last two treat of Laboratory Technique and the relations of Arthropoda to their Parasites.

The description of the general structure of Diptera (pages 8-150) is very complete and must have entailed a vast amount of examination and comparisons not only of specimens of the flies themselves but of the terminology of the various parts as laid down by different authors. Under the head of Chætotaxy it might have been advisable to have added a note of warning to the student regarding the variability of some of these hairs.

In the accounts of the various families of Diptera excellent keys to the genera and species are provided from the work of Specialists; these keys are often translated from obscure foreign publications and are therefore doubly useful. Excellent practical notes also occur scattered through more technical descriptions, as where, speaking of Sand flies (*Phlebotomus*) the authors write, "If a light is kept close to the bed, fewer will enter the net," an observation which may be commended to sufferers from the bites of Sand flies.

The section on Mosquitos (pp. 187-270) is very full, though information is necessarily restricted to those forms known or suspected to carry disease, and this section ends with some excellent practical hints on collecting, breeding and feeding mosquitos for experimental purposes; this last observation applies also to the chapters on other groups, such as the Tabanidæ and Muscidæ, whilst pages 411-424 contain practical hints on collecting, preserving and dissecting blood-sucking Diptera.

Fleas have of late attained unenviable notoriety in India as the carriers of plague from rats to man and Chapter V (pages 434-477) of the present book provides an excellent summary of the structure, life histories, habits and classification of fleas as a whole. Most of the original literature on Fleas, it may be noted, is contained in scattered and costly publications which are quite out of reach of the ordinary student.

Chapter VI (pages 478-526) contains an account of the blood-sucking Bugs, of which the Bed-bug is the commonest and most important in India. Our experience does not confirm the statement made here of Reduviidæ, that "as a rule they are diurnal in their habits;" we have always looked on this family as thoroughly nocturnal.

Chapter VII (pp. 527-564) supplies a long-felt want by providing in English a general account of the Anoplura, or lice, which are usually slurred over in most text-books. Much the same remarks are applicable to Chapters IX and X, which deal with Mites, Linguatulids and Water-fleas. Chapter XI, on Laboratory Technique, contains practical hints on instruments and methods for dissection, staining, etc., and will be found invaluable to the isolated worker.

The whole book is well planned and excellently carried out and should fulfil the objects for which it was written, which is defined in the Preface as the supplying of the needs of fellow-workers by compiling a guide to the relations between arthropods and disease rather than a general text-book of entomology. The paper and printing are good, though the excessive weight of a book of some 800 pages necessarily detracts from comfort in handling it. The Plates contain hundreds of original figures, excellently drawn and reproduced and adequately illustrating the text. We can cordially commend this book to all interested in the subject of insect-borne diseases—and who, in a country such as India, can fail to be interested?

T. B. F.

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## "MY SOMALI BOOK," A RECORD OF TWO SHOOTING TRIPS.

BY CAPT. A. H. E. MOSSE, F. Z. S., LONDON,
SAMPSON LOW, MARSTON & CO., LTD., 1913. Rs. 9-6.

In an early Volume of the Journal, Major (now Colonel) Swayne's well known book "Seventeen Trips in Somali land" was noticed and since then many books have appeared on sport and natural history in that country though none to compare with that work. This, however, cannot be said of Capt. Mosse's book, which though only the record of two expeditions is a worthy successor to "Seventeen Trips in Somali land," whose author by the way has written an introduction, and now that that country is practically closed to sportsmen is all the more valuable.

Capt. Mosse's two trips consisted of one of under four weeks and another of two months, and during the latter it had been his intention to penetrate Abssyinian territory, but owing to a mistake of the Post Office the necessary permit did not arrive till too late. In course of the two expeditions 19 different kinds of game were obtained, examples of nine of which were kindly mounted and presented to the Society's Museum by the author.

In the first thirteen chapters details are given of the different expeditions with descriptions of hunts after various kinds of game as well as general remarks on the various animals seen and shot, while the four remaining chapters are devoted to general notes and discussions, protective colouration of animals and rifles for big game.

The Somali leopard seems, if possible, to be a more wily animal to shoot than its Indian cousin. The usual way appears to be to sit in a zariba with a bait tied up outside, very different work, our author tells us, to sitting over a goat in a machan in this country. From his experience Capt. Mosse considers the lion the most dangerous game animal and in this he is supported by Mr. Selous; Colonel Swayne, however, puts the buffalo first and the lion together with the tiger, second. Other sportsmen have not such a high opinion of the lion and Mr. Maughan in "Wild Game in Zambezia" seems even to consider lion shooting poor sport.

In Chapter XV, Capt. Mosse joins issue with Mr. Selous on protective colouration in animals. The principal point of discussion is the striping of zebras which Mr. Selous says is not protective because the lion, which principally preys on them, hunts by scent and also hunts by night. To this Capt. Mosse answers that as regards hunting by scent "it is by no means certain as regards the cat tribe" and he goes on to say "the tiger and panther hunt mainly by sight and hearing." This, however, we venture to think does not prove that the lion may not hunt more by scent than the tiger, but on the other hand as Capt. Mosse says, Mr. Selous has produced no evidence to show that the lion does hunt by scent.

In the nocturnal habits of the Carnivora Mr. Selous considers another stumbling block to the protective colouration theory of the zebra, and here again Capt. Mosse points out that he "fails to take into consideration the great length of time during which evolution has been going on and that he assumes without sufficient justification, that the protective colouration of the zebra was brought into being by conditions precisely similar to those obtaining at the present day."

Capt. Mosse argues that the habits of both animals have changed and that at one time both were inhabitants of wooded country and that the lion hunted by day. "When this was his habitual practice it must have been an advantage to his prey to be unconspicuous. It is not difficult to imagine the process of evolution that took place; the zebra and the lion to begin with, both becoming less easy to see. It is not easy to be sure of the order in which changes occurred, but we may perhaps assume that to counteract the difficulty of seeing their enemy with his increasing stealthiness the zebra took to the plains, "while" as time went on the lion, finding it more and more difficult to capture his prey, would often find that it was only in the dusk, after going hungry all day, that he achieved success."

"A crepuscular habit once acquired and accompanied by a gradually increasing power of vision in a dim light would develop almost inevitably into a nocturnal one. The antelope or zebra meanwhile would develop still more its powers of scent and perhaps hearing, and, in the case of the latter, become more and more wholly a denizen of the plains." Now it is admitted by nearly all hunters that the zebra is harder to see at dusk, would it therefore be as easy for the lion to see it by night as by day? If not, why should it have taken to hunting by night? It may be said that the reason is that its prey would then be resting and be easier to approach, but on the other hand "C. H. S." in a recent number of the *Field* after writing about the animals the lion feeds on, says "none of the animals mentioned above show any great fear of the lion or leopard: they have grown accustomed to them. They can be found grazing peacefully in close proximity to them, and do not trouble to move out of their way unless a determined rush is made at them." There are many other points in this interesting chapter which one might touch on, but this is hardly the place, and while we do not think Capt. Mosse has quite proved his case he has brought forward many sound and interesting arguments.

The book is illustrated with many photographs, chiefly taken by the author, and pen and ink sketches of various subjects by Lt. D. D. Haskard, R A.

## "WILD LIFE ACROSS THE WORLD."

### Written and Illustrated by Cherry Kearton—London. Hodder and Stoughton, £ 1.

The brothers Kearton have long been well known for their excellent photographs of British birds and their nests, many of which have appeared in book form.

Except in special cases these kind of books have been greatly overdone, and we think Mr. Cherry Kearton, the photographer of the combination, has been well advised to try his hand at big game photography, which is probably more exciting and yields more valuable results. Mr. Radclyffe Dugmore and Herr Schillings have already shown what wonderful pictures can be obtained over kills and water holes, but Mr. Kearton has gone one better than these photographers and has taken not only single photos of many dangerous animals, but also rolls of moving pictures which have delighted visitors to numerous Cinema houses.

Various parts of the world were visited by Mr. Kearton in search of material for his camera and in the present book he tells us of trips to the States, Borneo, India and East Africa. The last named country gave the best results and most of the illustrations are from photographs taken there. Mr. Kearton on one expedition in East Africa was accompanied by several American Cow-boys who lassoed different animals, such as Giraffe, Warthog, Lion, and even Rhino, before his camera. This trip yielded ample material for moving pictures and stirring stories of the capture of the different animals are given in two well illustrated chapters.

From the point of view of readers in this country, the account of the author's Indian Trip is disappointing and the results reproduced are poor, as compared with those from other countries. Probably, however, the hurried nature of the visit to India accounts for this and we doubt not, but that if Mr. Kearton had more time, he would have been able to obtain just as interesting photos in this country as elsewhere. It is unfortunate that the author has not seen his way to reproduce the photo of the tiger mentioned on page 158.

Like many tourists and other visitors to India, Mr. Kearton is able to speak on tiger shooting with only a few days experience of these animals. He seems to think that the tiger is not a noxious animal but probably in many places, it does as much damage as the lion, though, of course, it is nowhere so numerous. Mr. Kearton too does not seem to have realized that the habitats of the two animals are not quite the same and it is not usually possible in India, as a rule, to shoot tigers as lions are shot in Africa. "And this reminds me of another difference between Africa and India. In the Dark Continent men take risks. They go out on foot, to encounter the lion. They are real sportsmen because their object is to destroy a noxious beast, an enemy of every other living thing, and they give him a sporting chance of life, by meeting him on his own ground, with their nerve and their rifle against his cunning and strength."

"In India the sportsmen attacks the tiger from the security of an Elephants' howdah, after that tiger has been routed out of the jungle haunts by unarmed beaters or else he sits up in a tree, secure from his quarry and waits until the latter comes along to tear up some terrified calf or goat. No, save in rare cases, tiger-shooting in India is an ignoble business; and nine out of ten tiger skins in English country houses merely mean that of a son of that house shot a beast which had no chance of retaliating on the man who killed him. Personally I set no value on such 'trophies.' I would much sooner have photographed the tiger and let him go on his way. Had I wanted to kill him I would have taken my chance on foot, in fair fight, as the lion-hunters do in Africa."

On this point we would like to have the views of our members who have had experience of both animals.

The book is introduced to the public by Mr. Roosevelt, who met the author in East Africa, and his brother writes a "Foreword"—a biography of the author, after reading which one is inclined to say "Defend me from my friends!"

Besides photos of big game there are many interesting pictures of birds reptiles and insects and the letterpress contains good accounts of the difficulties and excitements in obtaining the various pictures.

# MISCELLANEOUS NOTES.

## No. I.—NOTES ON SOME MAMMALS OF SIKKIM.

In Blanford's Mammals of India the Thar is given as a native of Sikkim on the authority of specimens procured by the late Mr. Mandelli from native shikaris. I knew this gentlemen well, and I know that these men went far beyond the boundaries of Sikkim; and as during my four previous visits to this ever delightful country, I had never been able to get a specimen or any certain proof of its existence, I had always been sceptical. Mr. Gammie, who lived many years in Sikkim, and who wrote the Chapter on Mammals for the Gazetteer of Sikkim, published in 1894, omits any mention of this animal. When at Lachoong in March last I saw at about 10,000 feet elevation on a rocky steep covered with brushwood a large animal which the Bhatias called Thar, and being unable to approach it myself sent a native to try and kill it. Three days afterwards he sent down the head of a very large old Serow (*Nemorhædus*) whose horn was 10 inches long, (the other was broken off when the animal fell from a cliff). On enquiry I found that this animal is generally called Thar, by the Paharias and planters who often kill them in the low hot vallies of British Sikkim. But Mr. Claude White tells me that during his long residence in the country he procured one specimen of the real Thar, whose head is now in his possession in England, and that he has reliable information of its existence in two places, namely, the eastern Singalelah range, north of the Rummam valley and the very steep and inaccessible mountains on the west side of the Tista valley between the Talung valley and the Zemu river which joins the Lachen valley just above Lamting.

It is much to be hoped that some European, who must be a really active and skilful mountaineer, will endeavour to explore this untrodden part of Sikkim and learn something more of this animal. April and October would be the best time to attempt it.

When I was at Lachoong with the late Mr. Blanford in September 1870, my Lepcha shikari killed a large Wild Dog, an animal which I had never seen alive until March last, when I saw one which had been eating the carcass of a dead Yak within a mile of Lachoong. Blanford in the Mammals says that the Malayan Wild Dog *Cyon rutilans* occurs in Tennasserim, but it is not known whether the Wild Dog of Northern Burma is this or the Indian species *Cyon dukhunensis*. Gammie in the Gazetteer of Sikkim, p. 236, says that the natives are very positive about the occurrence of two Wild Dogs, which differ in size and habits, as well as in colour. "The large sort they call Hindu, and say that it goes in pairs or in parties of 3 or 4 and is of a brownish colour with a black muzzle; the other sort which they call the Mussalman is smaller, of a uniform reddish colour, and going in packs of 10 or 12. The Hindu sort is in great request among native cattle doctors, who consider every atom of its body, including the bones, an infallible remedy in rinderpest. The Nepalese also declare it to be a sure remedy in dysentery and other diseases. The Mussalman sort is not generally of such high repute as medicine, and by some is considered worthless."

Before reading this I received exactly the same information from two English-speaking Nepalese of such position that I cannot doubt their belief in its accuracy, namely, Biroo Singh, Forest Ranger of the Tonglo forests, who further says that when the Gurung shepherds come to Sundukpho during the rainy season the Mussalman Dogs, which he has seen in packs of 12 or 13, kill many sheep. My other informant, Sirdar Bahadur Bhimdal Roy, was formerly forest ranger on Tonglo, where he procured for the late Mr. Knyvett and myself many new Lepidoptera in 1886, and is now Deputy Superintendent of Police at Darjeeling.

Mr. Lister of Pashok tea estate, where he has lived for many years, also believes in the existence of two species or varieties of Wild Dog, and tells me that his cattle are often killed by them. Mr. Claude White, though he knows nothing of the two varieties, tells me that he occasionally had his cattle killed by Wild Dogs at Gangtok. It seems very desirable that specimens of the two sorts should be procured and examined by a competent naturalist, as it is possible that the smaller sort may be the Malayan Wild Dog or an intermediate species. In the Calcutta museum is only one specimen of the Wild Dog procured many years ago in Sikkim, which, though too badly stuffed to judge from, seems to differ from that of the Plains in its smaller eye and much longer fur and tail.

Lastly, there seems to be little doubt that the Malayan bear which has not, so far as I know, been recorded in the Dooars or Terai occurs in Sikkim and Mr. Gent, the Divisional Forest Officer at Darjeeling, will probably be able to confirm this.

H. J. ELWES, F.R.S.

*March* 1914.

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## No. II.—A RECORD TIGER.

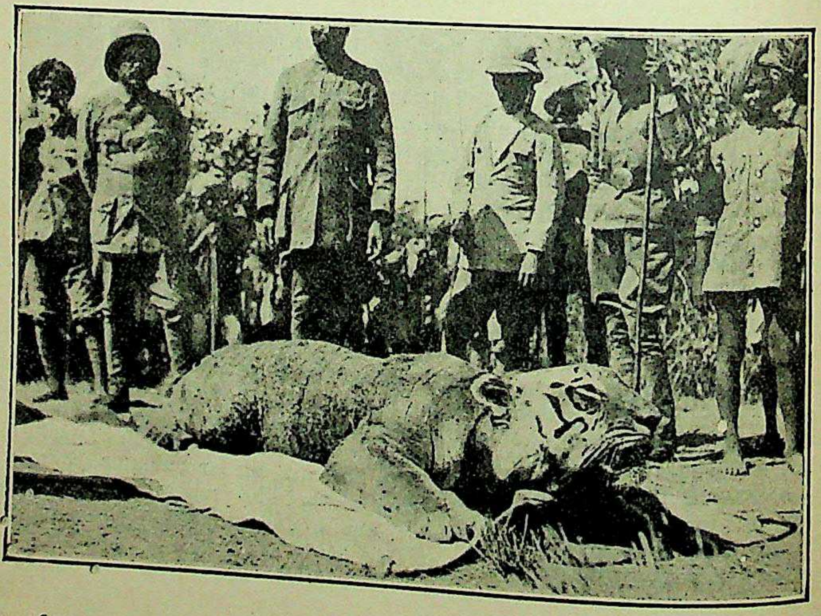
(*With a photograph.*)

On the 11th of this month at the 'Koovat Kho,' 5 miles north of Sipri, our Summer Hill Station, there fell to His Excellency the Viceroy's rifle a tiger which measured as follows:—

| | | | | |
|---|---|---|---|---|
| Total length | 11 | feet | 6 | inches |
| Head and Body | 8 | ,, | 2 | ,, |
| Tail | 3 | ,, | 4 | ,, |
| Height at Shoulder | 4 | ,, | 0 | ,, |
| Girth | 4 | ,, | 6 | ,, |
| Girth of fore-arm | 1 | ,, | 9 | ,, |

The tiger was measured along the curves of the body, of course before being skinned, in the presence of His Excellency Lord Hardinge and myself and our staffs, a party of about 25 people.

I enclose a photograph of the tiger.



Perhaps you would like to put the measurements and the event on record in your Journal.

M. SCINDIA.

JAI BILAS, GWALIOR, *15th April* 1914.

## No. III.—THE USE OF A HYÆNA'S (*HYÆNA HYÆNA*) TONGUE AND FAT AS MEDICINE.

As I should like to seek information on a certain subject I do not think I could do better than address you and trust you will excuse the liberty I have taken.

A short time ago in company with two friends I went out pigsticking and whilst beating the country we turned out a very decent sized hyæna and managed to account for his death by spearing him.

As we wanted the head and skin we asked our shikaries, mostly Kolis by caste, to skin the animal but this they refused to do, though later by great persuation we managed to get the animal skinned. We brought home the skin and head and the Kolis took away the meat and fat. As soon as news went around that we had killed a hyæna, people from almost all the neighbouring villages came to us and asked us for a little fat and a piece of the hyæna's tongue. Upon enquiring the reason for such a request we were told that the fat and tongue was a certain remedy for rheumatism and malformations of any bones. In fact these people expressed their willingness to give us whatever we wanted. When we told them what we did with the fat, half of these people went to the village where these Kolis were stopping, but whether they got what they wanted I do not know. What surprised us most was when a Bania came to my place and brought with him his hunch-backed son and wanted a piece of the tongue to apply to his son's back, stating that if he applied the tongue to his son's back the lump on it would disappear. I felt very sorry that there was no tongue left as I should have liked to watch the result. I have also been told that a hyæna's tongue is unsurpassable for the cure of splints in horses, but how far this is true I do not know.

I shall now feel much obliged if you or any of the subscribers to your Society will let me know whether there is any truth in the popular belief that the fat and tongue of a hyæna are the best remedies for rheumatism and other malformations of bones and, if true, what qualities there are in a hyæna's tongue to be able to remove splints in a horse's leg.

N. V. RINGROW.

ASSARA *via* DEESA, *21st April* 1914.

[We publish this as we cannot remember ever having heard such things being attributed to the hyæna in India, but in Anderson's Zoology of Egypt, Mammalia, Mr. Beadnell, in some field notes on the same species says :" The natives (in the Nile Valley) are very keen to obtain the heart, which they eat, believing that they thus obtain the courage (*sic*) of the hyæna. They also cut off the whiskers, if they get a chance, and keep them as a charm. The meat is also readily eaten by the poorer among them, and I found myself that the flesh taken from the head was not at all bad." This animal is usually looked down on in India by the natives as being cowardly.—EDS.]

## No. IV.—A BROWN VARIETY OF THE SLOTH BEAR (*MELURSUS URSINUS*).

Last Xmas when shooting in the Hazaribagh Jungles I shot a Brown Bear. Can you or any of the readers of your Journal tell me what this is?

There are no Brown Bears in the plains and it cannot have strayed there from Kashmir. Nor was it like a Kashmir Bear. It was more like the ordinary sloth bear of the plains, but brown instead of black. As far as I can make out its coat is shorter, softer and more curly than that of a black sloth bear and as it came towards me across a sandy nullah in the open it looked different from an ordinary black bear in shape, being much broader and having a more clearly defined outline.

It was heavy but I did not weigh it. It taped just over six feet. Its colour is a uniform brown, except its snout which is grey with a silvery gloss about it and the horse shoe mark which is yellow. Its eye I would call a very Irish eye. It is not brown but blue, a deep but very distinct blue as to the iris, with a pupil very dark blue or black. I have never seen or heard of such an animal, and I cannot find anything about it in my book. My shikaris had never seen one before. A friend tells me that the jungle men in the Orissa jungle tracts say there are two bears in their jungles, one black and the other red. This is the only suggestion of a red bear in the plains that I have ever heard of. Is there such a bear known?

I have compared the skull with two sloth bear skulls belonging to bears of about the same size and there does not seem to be much difference in them except that the one belonging to the Brown Bear is much broader.

C. SAUNDERS.

35, CHOWRINGHI, CALCUTTA, 19*th April* 1914.

[As we have not had an opportunity of seeing either the skin or skull it is difficult for us to offer an opinion but it may be a case of erythrism or partial albinism in the common Indian Sloth Bear (*Melursus ursinus*) of which R. A. Sterndale reported several instances in Volume I, page 69 of the Society's Journal.—EDS.]

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## No. V.—STRIPED WEASEL IN ARAKAN.

The Society has recently received the skin of a striped weasel, *Mustela strigidorsus*, Gray, from Mr. W. S. Thom. in Arakan. The occurrence of this weasel in Arakan is of considerable interest as it links up the previous known distribution, which was Sikkim and Tenasserim! Originally described in 1853 from two of Hodgsons specimens obtained in Sikkim, the only other known specimen from outside that country was collected by Signore Fea some thirty-five years later at Thagata in Tenasserim and recorded by Mr. Oldfield Thomas in Annali del Museo Civico di Genova in 1892.

N. B. KINNEAR.

BOMBAY NATURAL HISTORY SOCIETY'S MUSEUM,
*April* 1914.

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## No. VI.—NOTES ON THE SMALLER KASHMIR FLYING SQUIRREL.

I send you herewith six skins and skulls of *Sciuropterus fimbriatus*, which were obtained in June 1912 and June 1913 in Konani and Kothi Kanesar, Chakrata Hills. All the specimens were shot in the evening as they left the bungalow to go to feed.

My attention was first drawn to them by being wakened up about 4-30 a.m., by the noise made by these squirrels running about on the wooden ceiling and by a plaintive call of "Uñ Uñ" rather like that made by a monkey.

Their usual routine was to commence to move about on the ceilings about an hour and a half before dark and to come out when it was just too dark to see anything but the jump from the roof to the branch of a deodar about 4 feet away. They would then run up the tree for 10 or 15 feet and sit down either to "wash their faces" like a rat or rabbit or to wait for another of the party to join them.

They then dispersed for the night to feed and about 4 a.m., a thud on the roof would proclaim the return of the first of them. This would be followed by some scurrying about. Thinking that there might be a nest of young ones, I spent some four days in the roof hunting for them—I was, however, never able to find an animal, though in the evening they would appear again. Eventually I found some nests in the partition where they evidently lived and probably hibernate.

I tried to snare them but always failed, as they bit through the thin wire immediately they found they were caught, and in the end I had to shoot them as they left the building. They evidently do not always return to the same place, as some nights only two, and other nights four left the bungalow. This may have been due to their being so much disturbed. In 1912 I shot four in the Konani bungalow but no more could be got out of it, and as they were all males I began to wonder if the sexes separated except during the pairing season.

I then went to Kothi Kanesar bungalow. Here they made more noise than ever and evidently one old male tried to hunt the others out. This bungalow is one that is not so often occupied and in consequence the squirrels seemed to come out much earlier in the evening. Here, after amusing themselves chasing each other on the bare stone wall, they usually got on to the roof and planed to the nearest deodar about 20 yards away—one, however, made straight down the khud side to a tree quite 200 feet below. In this bungalow I got more specimens but they were again all males.

In June 1913 I was again at Konani and there were again four more tenants of the bungalow using the only entrance which I had left the year before. I shot two more, one being a male and the other a large female.

In the roof were large numbers of apricot stones and a few walnut stones each with a single hole bitten out. They were probably brought here by the squirrels though they might have been brought by rats. I have seen twenty or thirty mango stones below the hole in a tree from which I got a *Petaurista inornatus*. This tree was an oak and the nearest mango was not within a mile and a half, so it is probable that the apricots and walnuts had been brought from the village a mile away. The specimens were all shot in the evening so that the stomachs were empty except for lumps of gum or resin.

The usual food of this species is the seed of the various conifers and these animals must to a great extent prevent the regeneration of forests. I have seen the ground in Kashmir strewn with thousands of green cones destroyed by flying squirrels and in places in these hills you may see much of the same thing. They also eat the pines of the conifers and lumps of gum and resin and various fruits.

The only female I obtained showed no signs of being in young nor of having just finished suckling.

The colour of the specimens varies from rufescent to dark grey, about half of one colour and half of the other. The red specimens appear to be older animals.

The squirrels were smothered with a large red flea (I send you some specimens) which were not averse to a human diet.

H. T. FULTON, Major.

Dhera Dun, *March* 1914.

## No. VII.—VARIETIES OF MARKHOR HORNS.

With reference to the interesting photograph published in your last issue of a Markhor shot by Capt. Edwards, it may interest him and others to hear that a similar head has been seen this winter by a British Officer in the Barmai district. The horns were estimated to be about 45 inches in length and seemed to be exactly similar to those of Capt. Edward's animal. Mayadass, where Capt. Edward shot his head, and Barmai, where the second head was seen, are close together in the Haramosh district, and it is extremely probable that Markhor seen in Barmai in the winter go up to the top of Mayadass in the summer: the new head might be some relation of that shot last summer. Perhaps some of your readers might be able to offer some suggestion as to what conditions gave rise to this very rare type. I believe a similar but smaller head was shot a few years ago in the Chilas District.

J. F. TURNER, Capt., R.E.

Gilgit, *22nd February* 1914.

[Capt. Logan Home writes to us that "last year (1913) in Baltistan I saw no less that 5 Burhel-shaped heads (rather more so than the one in the photo in the Journal) in one herd; and there is a very much more remarkably shaped head in the Mess of the 38th Dogras here, which resembles an Oorial if anything." Eds.]

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## No. VIII.—A FEW NOTES ON THE WILD GOATS AND *FERÆ NATURÆ* OF NORTHERN ARAKAN, BURMA.

Until posted to the Hill Tracts of Arakan in September 1906 I had not had the good fortune to bag a Burmese Goral, the *Nœmorhedus griseus* of naturalists or the red Arakan Serow *Capricornis sumatraensis rubidus*, although some years ago when after Gaur I had once before in the year 1898 caught a glimpse of a Goral as, after uttering its strange sneezing, bark or scream, it jinked and bounded away down a hill side on a precipitous slope of the Thayetmyo Yomahs. I was fortunate enough however at that time to bag in the same locality on the summit of "Pézwa," a hill which overlooks the Mindôn or Matôn valley from a height of 5,000 feet, a fine male specimen of the Burmese or Sumatran Serow *Capricornis sumatraensis* the "Tawseik" or "Tawmyin" of Burmans about which, and the red Arakan Serow *C. s. rubidus*, I shall have more to say hereafter, for I am of opinion that three animals of the last named variety recently shot by me in the Arakan Hill Tracts, *viz.*, two females and a male, are a distinct form, being slightly smaller and more rufous in every respect than the animal bagged on the heights of Pèzwa, which besides being larger had also a shaggier coat and a longer mane and was of a distinctly darker or blackish grey shade. Blyth and Blanford both agree in uniting *C. s. rubidus* and *C. sumatraensis* whilst R. Lydekker considers that the former appears entitled to be regarded as a third local race distinguished by the extremely red tinge of the coat. Blyth originally described the red type as a distinct species in 1863 under the name of *Capricornis rubida*.

In my humble opinion, and I give it for what it is worth, it appears to me that although they belong to the same species they are different at any rate as regards colour and size and should therefore be given separate designations. Then again, although I have not come across the animal itself in Arakan or Burma proper, I have seen heads and horns of a third or black race of Serow with the hair of the frontal portion of the head which was of a jet black colour, whilst the horns which appeared to have the usual curve backwards and outwards from within a few inches of the tips, were, if anything, longer by an inch or two and more massive at the base than is to be met with in those of either *N. s. rubidus* or *N. sumatraensis*. These black Serow were I am told for the most part nearly if not quite black and were shot in the Chin Hills and are probably either *N. s. robinsoni* or the Malay Serow *C. s. swettenhami*. If I am correct in my surmise it would therefore appear as if there were three races or allied forms of Serow to be met with in Burma. But as I am treading on new and dangerous ground, not being an expert on these matters, I may be mistaken and am open to correction. I see from an article written by Mr. C. B. Moggridge which is published on page 981 of the Journal of the Bombay Natural History Society, Vol. XIX (No. 4), that the black and the rufous variety exists in most part of Upper Burma. It would be interesting to know whether the rufous-red variety shot by him was the *C. s. rubidus* or only a form intermediate between the black and the red or in other words the *C. s. sumatraensis* and whether the black variety which he has not named was *C. s. robinsoni* or *C. s. swettenhami*. With a view to having the head mounted I succeeded in saving the mask and skin of the last animal shot by me here in May this year, a very old male of the *C. s. rubidus* type. The following, although a somewhat clumsy description, is as accurate a description of this animal as I was capable of putting down on paper at the time.

Height 35½ inches; length from nose to tip of tail 54 inches; girth of body 38 inches; length of both horns 9½ inches, girth of ditto at burr or base 5¼ inches.

The hair of the upper portion of the back and body extending from the tail to neck and down either side for a short distance, was of a dark brown or rusty red colour. The back and upper portion of the body and legs was of a distinctly darker brown colour than the upper or under portions of the neck which was of lighter brown or yellow colour whilst a dirty white or light yellow patch extended from the chin to the throat and chest for a distance of about a foot. A distinct black line or dorsal stripe of short black hair, from a quarter to half an inch in width, extends from the root of the tail along the back where it disappears on meeting a short but perceptible mane of about two or three inches in length of a dark brown colour which extends from the neck backwards along the back for a distance of about 15 to 18 inches. The coat along the whole of the back portion of the body from tail to mane for some 8 to 10 inches down and along either side of the dorsal stripe and for about three quarters of the animal's length has a grey or grizzled appearance, the brown or red being somewhat profusely interspersed with grey or white hairs. These grey hairs were nearly if not entirely absent in the case of the two females shot by me in the same locality and I am of opinion that the grey or grizzled appearance along the back of the red variety is only met with or is more marked in the case of very old males. The ears were edged and tipped with very short black hair whilst the hair inside the ears which was thin and longer though scanty, was of dirty whitish appearance. Hair on lips of a dirty white or yellow colour. Hair on body, neck, head and ears generally very short and scanty in some places and of a dirty yellow or light brown appearance on inside of legs and down to the hoofs. Hair on stomach and legs longer than on rest of body although not plentiful. Tail thinly clad with a bunch of coarse hair running to a point. The tail alone without the hair measured 3¼ inches and with the hair 4½.

Tail bare underneath. Colour of hair on tail of a dark brown colour verging on black. I am afraid many of the details recorded have been noted before and are doubtless worthless to a naturalist but they may nevertheless interest other sportsmen. I regret to say that I did not record at the time it was shot an accurate description of the Serow bagged on Pézwa hill in the Thayetmyo Yomahs already referred to and unfortunately neither the skin nor the head is now in my possession having been accidentally destroyed in a fire some years ago. I do not either now, I regret to say, possess the skin or head of another animal, an old female, shot by me in the Ruby Mines District in 1892 a poor description of which is given on page 184 of the work “Wild sports of Burma and Assam.” Although the description given there might have been better, it is sufficient I think to enable one to identify it as the same type of animal which was shot by me in Thayetmyo in 1898 and which I take to be the *N. sumatraensis.*

Shortly after my arrival in Paletwa I heard of a famous horse shoe shaped rocky plateau known as “Kyauk-pan-daung” or translated literally from Burmese, the flower covered rocky hill, some 4,500 feet in height which was situated some 26 miles to the east of my Headquarters and to the top of which a rough bridal path existed, where it was also rumoured that an occasional bison was to be met with along its open grassy tops whilst the precipitous grassy slopes and rocky cliffs which skirted the plateau on its western face for a distance of nearly 8 miles was said to be the resort of goral and serow. I made a mental vow that it would not be long before I visited the plateau and took toll of the game to be found there. I had been told before my departure for Arakan that there was little or no big game shooting to be had in the Arakan Hill Tracts owing to the large number of guns which were in the possession of the hill people and because of the dense bamboo jungle and undergrowth which existed everywhere, the result of hill clearing and annual firing for purposes of cultivation, which made stalking an utter impossibility, and that bison and rhinoceros were rarely if ever met with by the inhabitants, who were moreover skilled trappers who snared anything they could not shoot, from the smallest bird to the largest animal.

I found this only too true afterwards in many respects although there were still a few bison, goat and rhino left which I straight-way made arrangements should not be molested in future by the natives, as these animals seldom if ever molest the people or their crops. My observations and experience has shown me that the only animals which do any appreciable damage to the crops here are pigs, monkeys and sambur and of the bird tribe parrots and rice birds. Elephants are scarce and are never seen amongst the crops, having been hitherto so relentlessly hunted and shot down by the wild tribes living in this and in the unadministered territory, but more especially in the latter place, that they now always inhabit the densest patches of jungle to be found. One or two small herds of 10 or 15 animals have settled down in a large valley known as the “Kin” at the foot of the Kyauk-pan-daung range where they should multiply if not molested, whilst two other small herds may be met with along the banks of the Ru and Lemro streams in the vicinity of the Lower Lemro and Pengwa Police posts. The one desire of the hill people in these parts is to become possessed of a gun and an unlimited supply of ammunition in order not only to supplement their food-supply, but to make a living by the sale of the meat, hide and horns of the animals shot by them. But this no doubt is a very common and reasonable enough desire and applies as well to other races within and outside the Province of Burma. It is not easy nevertheless to know where and when to place restrictions or where to draw the line or to distinguish between the man who desires a weapon solely for the legitimate purpose of protecting his crops and the man who wishes to use it in order to make money easily. It is not possible to expect that a headman or villager who having received a gun from Government ostensibly for the purpose of protecting himself or his crops will refrain from wandering away into the jungle miles away from them in search of a sambur, pig, bison or rhinoceros, the bagging of any one of which he knows will bring him in food as well as money, or of lending his gun to more skilled hunters than himself for the same purpose.

W. S. THOM.

PALETWA, 11*th November* 1910.

[The above note by Mr. W. S. Thom was written in 1910 and originally intended for publication in the "Indian Field" but never sent. Recently Mr. Thom came across this note and offered it to us. He has kindly allowed us to make a few alterations in the nomenclature as brought up-to-date by Mr. Pocock.—EDS.]

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## No. IX.—NOTES ON THE DOMESTIC YAK OF THE TAGHDUMBASH PAMIR.

(*With a plate.*)

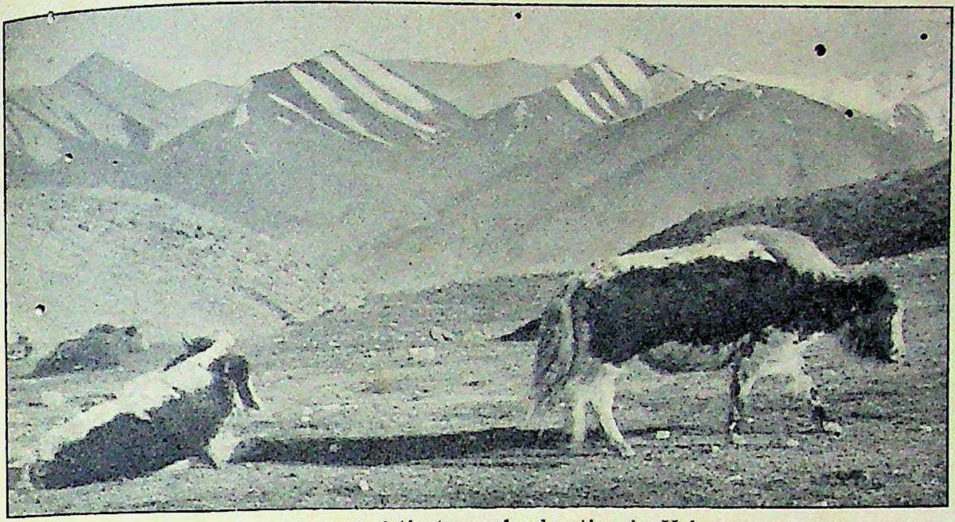
Of all the domestic animals of the Pamir Plateau, none are more interesting than the Yak known by its owners as the "Khushgao." It is a strong and sturdy creature, with short legs, low quarters, head hanging close to the ground, warmly clad in thick long hair and with a great bushy tail. There are two varieties of the domestic yak, the horned and the hornless, which seem to be completely distinct. From what I could learn, each variety breeds true; the horned always producing horned offspring and the hornless producing hornless offspring, but the problem as to what would be the characters of a calf, resulting from the union between horned and hornless parents, seemed to be far beyond the limited intelligence of a Pamir Nomad. Many yaks are subjected to castration at about the age of one year but this has no relationship to the absence of horns. The length of the horns is somewhat variable but the mean of a number of measurements gave an average length of 22 inches. The majority of yaks are of a uniform black colour but there are often to be seen animals of a light brown or dun tint. Should a yak of a black colour vary in any part towards a different colour, that varying colour is always white, and it may be taken as a rule, to which I saw no exceptions, that if any part of the body is white then the face will also be either partially or completely white. A white face and a white tail, associated with white on the legs, is a very common variety and when a similar band runs along the spine in continuation with the face in front and the tail behind and accompanied beneath by a white belly, a most frequent and characteristic mode of coloration is then assumed. The brown colour enters into the same combinations with the white as does the black, but, on no occasion, was black ever seen associated with brown in the same animal.

The body of the yak is clothed in a thick warm coat of hair or rather in a coat of two different kinds of hair which vary greatly in winter and summer. Superficially is seen the covering of long, thick, straight hairs, hanging vertically downwards over the greater portion of the trunk and, though curled on the lower portion of the limbs, is especially long over their upper parts, over the angle of the jaw, the tail, the sides of the abdomen and forming a bushy tuft between the horns and prolonged down from the neck as a thick strong mane. Conspicuous as is this clothing of long hair, it does not appear to be the important means of maintaining the bodily warmth throughout the rigorous winter climate; for underlying it, and in close contact with the skin, is a dense coating of fine hairs, closely matted and interwoven together and protecting the whole body in a warm wool-like covering. The superficial coat may be considered as permanent, in that it does not alter in density according to the season, but the underlying coat, which in the winter becomes thick and bulky, falls away in the months of March and April, and, in the early summer, can be seen in scattered patches still attached to the animal, especially about the neck and shoulders, separated completely from the skin and capable of being pulled out in large handfuls. The yak is not the sole creature on the Pamirs that throws off its winter garments in such great profusion. The camel, though in winter clad in the thickest and warmest of hairy coverings, in summer becomes entirely naked and from the bodies of even the domesticated dogs I have seen thick layers of wool hanging to their bodies, the remnants of a uniform coating which in winter clothes them. The young yak differs markedly from its parent in the absence of those long hairs which so characterize the latter, and they do not appear to become noticeable in calves until the second or third month. The nomads find both varieties of hair useful for different purposes. With the long hairs they plait ropes and the fine underlying coat they weave into carpets.

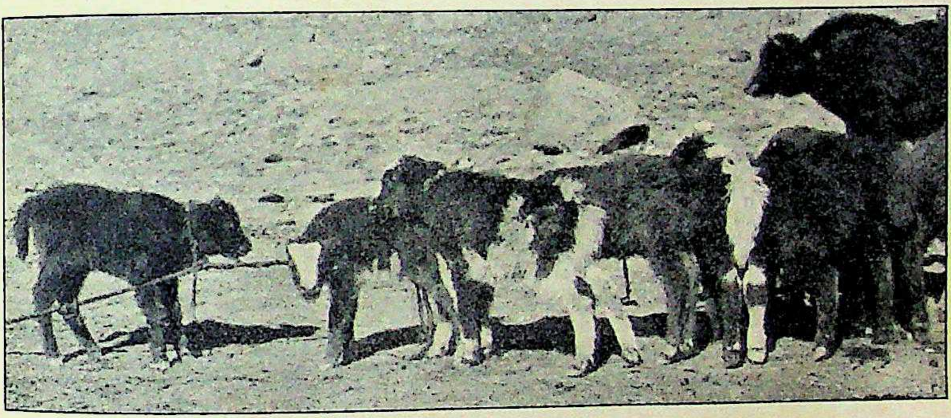
It may be of interest to refer to some of the habits of the yak. Like others of the bovine species it delights in standing up to its middle in running water and is often seen wallowing in the icy rivers descending from the snout of a glacier. It climbs thousands of feet up the mountain side in search of fresh grazing grounds and, in spite of its apparent clumsiness, the cleverness and agility it displays in clambering from rock to rock is amazing. It is an extraordinary patient creature and will often remain almost immobile for half an hour at a time. A clever rider can urge this ungainly beast into a steady amble and, on occasions, into a smart gallop; and it is a strange characteristic that so drowsy and sullen a creature will sometimes start at strange objects as foolishly as a skittish horse, while, at other times, it becomes so sleepy as to lie down beneath its rider. The hinder portion of the spine is extremely tender and the rider takes a cruel advantage of this by continually pounding the animal on the tender area with a thick stick. To such an extent is this unfeeling act prolonged that at the end of a long march every yak is suffering from a bleeding and ulcerated back. The yak loves companionship. A herd of the creatures, moving together, will travel at a rapid pace but if one be separated from the remainder of the herd or if a single animal detects others of its kind on a neighbouring hill-side, it will exert all its pertinacity and stubbornness in the endeavour to join them. When a yak becomes determined to travel no further, and this often occurs when it is confronted by a steep hill, it depresses its head almost completely to the ground, strains painfully on the nose rope and, in spite of all human persuasion, both gentle and severe, it obstinately turns round and rushes precipitously down the slope. The yak is in its element in the snow. A herd usually travels in single file and each member will carefully place its feet in the imprints left by the hoofs of the one which preceded it.

An interesting deformity was, on one occasion, observed. From a point in the centre of the face, about three inches above the anterior margins of the nasal apertures, was seen growing forwards a third horn. The horn was about two inches in the vertical diameter and one inch transversely and was oval in shape, with the long axis directed upwards. It was not more than a few inches in length and was truncated owing to the tip being broken off. Its direction was downwards and forwards, and the broken end tended to turn upwards. The yak delights in licking the snow and, in the valleys, may sometimes be noticed eating quantities of earth, presumably for the purpose of obtaining the saline ingredients which, in places, cover the ground with a white efflorescence.

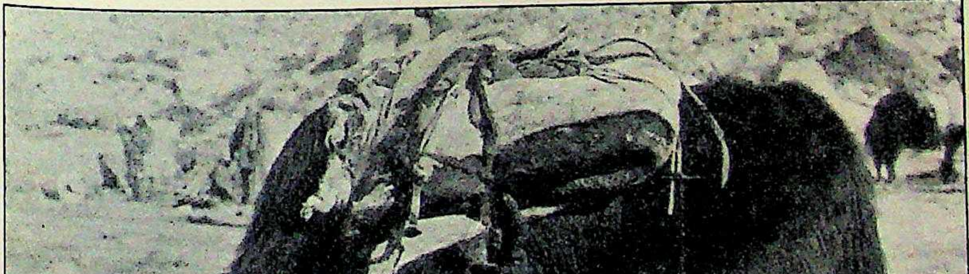
The yak, though the beast of burden of the nomads, must be considered as only partially domesticated. It finds its food where and when it



A characteristic type of coloration in Yaks.



Yak Calves.



A Riding-Yak.

THE DOMESTIC YAK.

can. The production of its young does not occur at irregular intervals and independent of season, but the calves are born in the early Spring, about the month of March. The cold and scarcity of food greatly thin their numbers and one nomad told me that he had lost as many as twenty animals in the preceding Winter. It is dependent not on the care and attention of its owners but on the abundance of food and the clemency of the season. It lives in a continual struggle with the fiercest elements of Nature in the bitter cold of those silent altitudes.

R. W. G. HINGSTON, Capt., I.M.S.

Abbottabad, *February* 1914.

## No. X.—INTERESTING BIRDS FROM JHELUM DISTRICT, PUNJAB.

The following birds obtained or noted in Jhelum District during the past year are perhaps of sufficient interest to be placed on record.

1. The Spotted Flycatcher (*Muscicapa grisola*, Linn).—A single male obtained at Sardi (2,900 ft.) in the Salt Range on 10th September 1913. I can find no previous record for the Punjab.

2. The White-throated Fantail-Flycatcher (*Rhipidura albicollis*, Vieill.)—A pair seen in the District Board Garden at Jhelum on 5th November 1913 and a single bird seen in the same place on 13th January 1914.

3. The Dark-grey Bush-Chat (*Oreicola ferrea*, Hodgs.)—Two males were obtained in the District Board Garden at Jhelum on 20th October 1913 and 27th February 1914, respectively.

4. The Red-flanked Bush Robin (*Ianthia rufilata*, Hodgs.)—A single female was obtained in the Government Forest Rak at Jhelum on 2nd January 1914.

5. The Pine Bunting (*Emberiza leucocephala*, S. G. Gm.)—An adult male was obtained from a small flock on the Golf course at Jhelum on 18th February 1914, and a solitary female was obtained at Dumman on 3rd March 1914. In addition to the above I saw a number of birds probably of this species at Dhodha, P. S. Dumman, on 10th April 1913. This appears to be an extension of the known range.

6. The Great Himalayan Barbet (*Megalæma marshallorum*, Swinh.).—A single female was obtained at Jhelum on 1st April 1914. It was moving about in tall trees in my compound and was rather shy.

7. The Smew (*Mergus albellus*, Linn.)—On 12th January 1914, I secured a female out of a small flock that were busily engaged in diving in the Jhelum river, a few miles above Jhelum.

8. The Turkestan Penduline Titmouse (*Anthoscopus coronatus*, Sewerz.)—On 27th March 1914, I met with a small party of three or four birds feeding in a Shisham tree in the Government Rak at Jhelum. I had no gun with me but was able to examine them from a very short distance and so identify them from the grey crown, very broad black eye band extending from the lores to the nape, chestnut mantle, cream white and rufous underparts. I have no doubt whatever but that the birds were correctly identified, and from the previous reported occurrences at Sukkur and Kohat it is not very curious that stragglers should be found at Jhelum.

HUGH WHISTLER, M.B.O.U.,
Indian Police.

Jhelum, *March* 1914.

## No. XI.—THE NILGIRI BABBLER (*ALCIPPE PHÆOCEPHALA*) IN THE BASTAR STATE, CENTRAL PROVINCES.

In the *Fauna of British India, Birds*, Vol. I, p. 158, Oates records the distribution of this bird from Khandala to Travancore along the Western Coast of India, also at Pachmarhi in the Central Provinces; further he states that there is an *Alcippe* in the British Museum from Pareshnáth Hill which he is inclined to identify with the present species. It is interesting therefore to note that on January 22nd of this year I secured a specimen of this bird at Parasgaon in the Bastar State.

E. A. D'ABREU, F.Z.S.

THE MUSEUM, NAGPUR, 9*th March* 1914.

## No. XII.—THE YELLOW-BREASTED BABBLER (*MIXORNIS RUBRICAPILLUS*) IN THE BASTAR STATE, CENTRAL PROVINCES.

Three specimens of this bird were obtained in January of this year on a collecting trip in the Bastar State at Parasgaon.

I do not think this species has ever been recorded in the Central Provinces or further west, on the plains, than Chota Nagpur, so the record is interesting.

E. A. D'ABREU, F.Z.S.

THE MUSEUM, NAGPUR, 9*th March* 1914.

## No. XIII.—AN ABNORMALLY COLOURED SHAMA (*KITTOCINCLA MACRURA*).

On the 14th March I went to Tagundaing, about 1,000 feet elevation in the South Shan foot-hills on the Thazi-Kalaw road. There in the jungle, off the main road, I shot a bird which I did not recognise and being unable to skin it, as I had hoped to do, I wrote a careful description of it, which I append. I think it is of sufficient interest for the journal owing to its resemblance to the Andaman bird and I should like to hear if any other members have met with similar variations in this species. I have classified it as *K. macrura* for the obvious geographical reason, but it is certainly nearer *albiventris*. I should mention that the bird was a female with ovaries in a state of development suggesting that it would shortly have been laying.

Length 7·6 inches, tail 4, wing 3·5, tarsus ·9, bill from gape ·93. Iris dark brown. Eyelids plumbeous. Bill black, base of lower mandible horny brown. Mouth fleshy. Legs and feet fleshy. Claws very pale horn. Head all round, back, scapulars and wing coverts sooty brown. Rump and upper tail coverts white. Tail: middle two pairs blackish; next pair same with a narrow tip to inner web and a broad (one inch) tip to outer web white; next pair same but one inch white on inner and one and a half inches on outer web; next two pairs same but an equal or almost equal amount of white on tips of both webs. Quills dark brown. Chin tinged ashy brown tinged with ashy. Throat and upper breast sooty brown. Lower breast rufous. Abdomen and under tail coverts white. Flanks brown, the feathers edged with rufous. Wing lining whitish mottled with brown.

I much regret not having been able to keep the skin.

PYAWBWE, 19*th* March 1914.

F. E. W. VENNING, CAPT., M.B.O.U.

## No. XIV.—THE BREEDING HABITS OF THE BROWN-BACKED INDIAN ROBIN (*THAMNOBIA CAMBAIENSIS*).

I append descriptions of two nests of the Indian Robin which were placed in sites different to any described in Mr. Pitman's note on the nesting of this species at p. 796, Vol. XXI of the Journal. Both nests were found in the stony nullahs by the R. Sohan which is the favourite haunt of the species near Rawal Pindi. In both the Rawal Pindi and Jhelum Districts (and the same peculiarity has been noted at Kohat) the Indian Robin is practically confined to the arid stony hills and nullahs, clothed with coarse grass and scrubby bushes, being but seldom found in gardens and cultivation which seem to be its natural habitat down country.

*28th April* 1911.—C/3 slightly incubated eggs found in a nest built under a large stone balanced on two others: to the front the nest was fairly open, while at the back there was a small hole—almost a short tunnel—used by the female as a "bolt-hole" when the nest was approached from in front. The nest was very flimsy, built of coarse dry grass roots, and lined with fur, horsehair, and portions of snake's slough. Many bits of earthern cocoons were mingled with the foundations, possibly by way of binding the grass.

*15th May* 1911.—C/3 rather incubated eggs from a deep cup composed of grass, roots, etc., and lined with fine roots and horsehair, which was built under a stone behind a tuft of foliage on a steep bank, a few yards from the water's edge.

HUGH WHISTLER, M.B.O.U.,
INDIAN POLICE.

JHELUM, *March* 1914.

## No. XV.—THE OCCURRENCE OF THE BANK MYNA (*ACRIDOTHERES GINGINIANUS*) NEAR MADRAS.

On January 14th, an adult male specimen of *A. ginginianus* (the Bank Myna) was captured at Vandalur, a village twenty miles South of Madras, by one of the Museum suppliers. It was found feeding on a field near the village in company with several common Mynas (*A. tristis*). It is now preserved in the Madras Museum.

According to Oates (*Fauna of British India*) this species is not found South of the Nerbudda and Mahanadi rivers, while Jerdon in his '*Birds of India*' asserts "It certainly does not occur in South India, notwithstanding its specific name taken from Gingi, South of Madras."

B. SUNDARA RAJ, M.A.,
ZOOLOGICAL ASSISTANT.

MADRAS GOVT. MUSEUM, *February* 1914.

## No. XVI.—A NEW SWIFT FROM BURMA.

## THE BURMESE SWIFT (*MICROPUS PACIFICUS COOKI*).

(*With an illustration.*)

Harington, B. B. O. C., XXXI., p. 57 (1912). Ibis 1914, p. 22.

*Description.*—Similar to *M. pacificus*, Latham, but smaller, the white band across the rump narrower, about 10 mm. wide instead of 15 mm.; only the feathers on the middle of the throat white, with well-marked black shaft stripes, those on the sides of the throat black fringed with white producing a barred appearance; the back and mantle deep glossy black with a metallic sheen.

Wing 170 mm., middle tail-feather 51 mm., lateral tail-feathers 75 mm.

Mr. Tom Iredale, M.B.O.U., has pointed out to me the following interesting differences between this new sub-species and the Large White-rumped Swift from China.

"In the typical *M. p. pacificus,* the wing is very long, with narrow elongate feathers. The second primary noticeably the longest, the first about 8 mm. shorter, whilst the third is about 12 mm. shorter; that is, the first is longer than the third; the fourth about 18 mm. shorter than the third, and the rest correspondingly shorter."

"In the sub-species *M. p. cooki,* the first primary is longest; the wing is shorter, and the feathers broader than in the typical form; the first is 2 mm. longer than the second, which is 10 mm. longer than the third; the third is about 15 mm. longer than the fourth, but the rest do not decrease so quickly as in the previous one."

"The tails also show corresponding differences. In the typical *M. pacificus,* the tail is long and deeply forked, the tail feathers narrower; in *M. p. cooki,* the fork is less deep, while the tail feathers are broader.

*M. p. pacificus.*—Outer tail feather is 10 mm. longer than second, which is 16 mm. longer than third. Fork of tail 35 mm. deep.

*M. p. cooki.*—Outer tail feather is 2 mm. longer than second which is 6 mm. longer than third. Fork of tail 24 mm. deep.

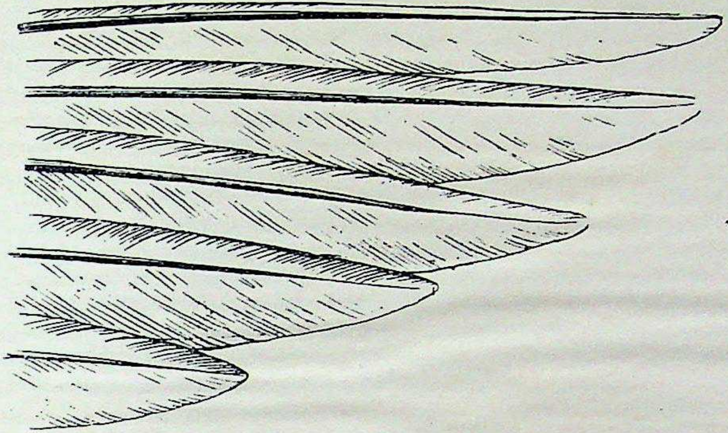
It is a well known fact that migratory birds, which are generally accustomed to cover long distances, generally have long pointed wings, and as soon as they give up the migratory habit, their wings become shorter and broader.

This is very well exemplified in the "Flight of Birds" Series in the Natural History Museum, where the wings of the European House Martin (*H. u. urbica,* L.) and the Algerian House Martin (*H. u. meridionale,* Hartert) are displayed. The former being a highly migratory species, summering in Northern Europe and migrating for the winter to Africa, whilst the latter is a resident species, spending the whole year in North Africa. These differences closely correspond with those of the two Swifts. *M. p. pacificus,* breeds in Siberia and North China and migrates to Australia, and has consequently a long pointed wing, whilst *M. p. cooki* is in all probability strictly resident, or only leaves its breeding haunts for a very short time, and has therefore developed a shorter and broader wing.

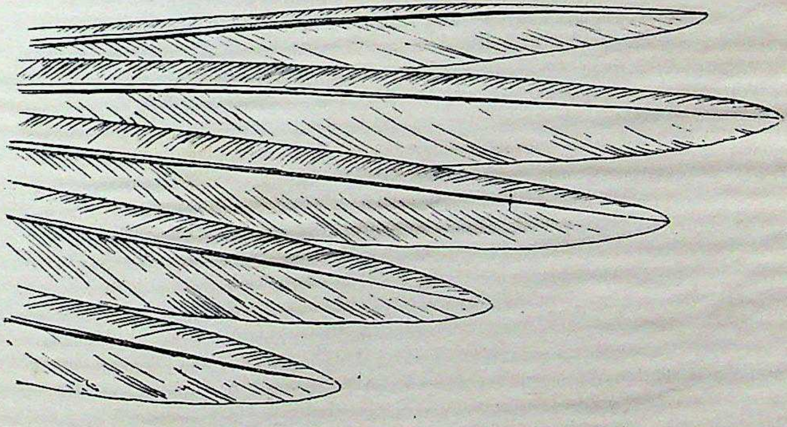
I first noticed the Burmese Swift in the Goteik Gorge in February, when they were flying about near the railway bridge in thousands. In June I paid a visit to the famous caves, where I found them breeding. Mr. J. P. Cook informs me that he found them inhabiting some caves about 30 miles north of the Goteik Gorge, in Yatsauk State; where they were literally in thousands, this was in October, they can therefore only leave their breeding haunts at the most for two or three months, and in all probability do not leave at all. This point can easily be settled if members of the Society at Maymyo or in the Northern Shan States would report whether the Swifts are seen in the Gorge in the months of November, December and January.

*Distribution.*—Probably throughout the Shan Plateau, and breeding in the numerous lime-stone caves which are found throughout that region. There are the following specimens in the British Museum, besides those collected by Mr. Cook and myself:—1 specimen collected by J. Davison 5. 7. 74. at Amherst and 1 specimen collected by Thompson 7.1.01. at Maukmai.

*Nesting.*—In June I found the Burmese Swift breeding in thousands in the Goteik caves, which form a natural bridge through which the river flows, and over which is constructed the railway viaduct (which is said to be the



*M. p. cooki.* (nat. size).



*M. p. pacificus.* (nat. size).

A NEW SWIFT FROM BURMA.

highest bridge in the world). All the nests were inaccessible without the aid of ladders, being built against the roof or sides of the caves overhanging the river. Although so well protected from enemys from below, they appear to be victimised by bats, which simply swarm in the caves, making their presence known by their noise and stench, as I picked up a number of eggs which had clearly been sucked. I also picked up a fully fledged young bird, and a nest. This was saucer-shaped and composed of leaves and grasses, and lined with a few feathers, the whole being cemented together with saliva. I have been told that they also breed in the railway tunnels on the far side of the Gorge. The eggs I picked up were a glossless white, and in shape very long elongated ovals, and measured 1·0 × ·67 inches.

I was informed in Maymyo in 1912, that early in the year a large number of Swifts appeared and haunted one of the bridges in the B. I. Lines, and then suddenly disappeared again. Whether they belonged to this species, or were the Malayan House-Swifts (*M. subfurcatus*) I could not discover.

I hope that members stationed at Maymyo, will report if these Swifts appear again,—and also whether *M. p. cooki* is found in the Goteik during the winter months. I should also be extremely grateful for any eggs, which I was unable to procure myself.

LONDON, *January* 1914.

H. H. HARINGTON, MAJ.

## No. XVII.—NOTES ON DOVES IN THE PUNJAB.

A perusal of "Indian Pigeons and Doves" shews that there is apparently but little on record with regard to the Punjab, so the following remarks may be of interest. No mention is made of the migratory habits of the Red Turtle-Dove (*Œnopopelia t. tranquebarica*) which in the northern Punjab at least are very pronounced; for it is a summer visitor arriving in considerable numbers for the purpose of breeding. To judge by my own observations (which I should be very glad to have either refuted or strengthened), the movement north must be a very leisurely one, there being a slight corresponding difference in the dates of commencement of nidification between in the north and south portions of the Punjab.

In Ferozepore District (1912) I noticed the first bird on 25th February, and at Phillaur (1910) I found the first nest with eggs on April 9th, but failed to note how much earlier the species had arrived. Here in Jhelum district this year the first bird was heard on 20th March and they were numerous before the end of the month. Whereas in Rawal Pindi district (1911) I first noticed them on April 23rd on which date they were numerous, and at least a few must have arrived a little earlier as I found two partly incubated eggs in a nest on May 4th. Capt. Whitehead records the species as a summer visitor at Kohat from the second week of April until August.

The return movement in Jhelum takes place about August; practically all the birds have gone by the end of the month, the last bird noted being seen on 2nd September.

In this connection it would be interesting to learn on what date Mr. Pitman saw the large flocks of males in Chanda district, C. P. as the fact may have had some connection with this annual migration.

The usual note is a long sustained purring coo—very distinctive in character. Another highly migratory species in these parts is the Indian Turtle-Dove *Streptopelia turtur ferrago*, which breeds commonly in the Murree and Hazara hills occurring in the neighbouring plains districts on migration.

In Rawal Pindi District (1911) I found these handsome Doves extremely numerous in the wooded portions of the Topi Park from the middle of April up till the middle of May, when I left for the Hills. They were noticeably shyer than the other species of doves and but seldom found out of the denser woods. In 1912 they were there on the 5th May when I passed through. I have not been in Rawal Pindi during the autumn migrations, but they doubtless pass through in October, as at Nathia Gali last year I found them in flocks preparing to depart during the last half of September and a few occurred at Jhelum during the last week of October. A few occur at Jhelum on the spring migration also. As for their status in the rest of Punjab—save for Kohat where they are similarly spring and autumn migrants—I can obtain no information; any notes on the subject would be welcome.

In the Punjab—apart from the hill districts like Kangra and part of Rawal Pindi—the Spotted Dove (*Streptopelia s. suratensis*) is apparently rare or a seasonal migrant only, for the only part where I have met it is Jhelum: here on four occasions only, from November to March, I have met with a pair and three odd birds, probably stragglers from the Jammu Hills.

With regard to the Eastern Stockdove (*Columba a. eversmanni*) it would seem to be in the Punjab a spring and autumn passage migrant rather than a winter visitor, but more evidence is greatly to be desired: personally I have only met it at Phillaur towards the end of April, and near Fazilka, Ferozepore district, about the middle of October; on both occasions it occurred in large flocks. Hansi in March and Kohat in the latter half of April are the only dated records which I can find.

With regard to the Green Pigeons in the Punjab, the published material is very scanty; any evidence as to species obtained with dates and localities would be very welcome to enable one to work out their distribution in these parts: in many districts they would seem to be entirely absent.

I should be very grateful to anyone who would either corroborate or disprove the correctness of any of the above remarks on the distribution of our Punjab Pigeons and Doves.

H. WHISTLER, M.B.O.U.,
Indian Police.

JHELUM, *March* 1914.

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## No. XVIII.—DOVES IN BOMBAY.

In his "*Indian Pigeons and Doves*" Mr. Stuart Baker, writing of the distribution of the Spotted Dove *Streptopelia s. suratensis* says "Both "Eha" and Dewar state that this dove is never found on the Island of Bombay, though both the little Brown and the Ring-dove swarm." As this hardly agrees with my experience I have thought it worthwhile to give the quotations referred to from the works of "Eha" and Dewar.

"Eha" writes of the Spotted Dove: "On the mainland and islands just across our harbour it is very plentiful, but I have never seen it in Bombay. The doves I have met with about Cumballa and Malabar Hills all belong to the species so common in Poona" (*i.e.*, *risorius* and *cambayensis*). Dewar says: "It is the commonest dove of Calcutta, of Madras, of Travancore, of Tirhoot, of Lucknow but not Lahore or Bombay or the Deccan."

Either the birds have changed or "Eha" made a mistake, but certainly *Streptopelia s. suratensis* is found in Bombay now. Mr. Comber in his List of Birds in the Bombay City Gazetteer gives this species and the little Brown Dove, not mentioning the Ring-Dove in Bombay. On the southern end of the adjoining Island of Salsette all three species are very common.

BOMBAY, *April* 1914.

N. B. KINNEAR.

## No. XIX.—THE SNOW PIGEON (*COLUMBA LEUCONOTA*) AT A LOW ELEVATION.

I saw in February 1913 at Rajpur, Dehra Dun, a flight of 30 birds, elevation 2,200′. There was at the time a heavy storm going on in the hills.

When staying at Lambatch bungalow (about 7,500′ ) I saw often as many as 50 or 60 of these pigeons on a patch of scrub 20 yards square. The birds were feeding on the berries of the Bekhla, and many of them were taking the berries while hovering over the thin branches which were not strong enough for their weight. The places where the birds usually fed were about 6,000′ to 6,500′. The birds are known locally as Bekhla, the same name as the plant.

The forest thereabouts is closed and is leased from the Raja of Tehri and consists mostly of Kail (*Pinus excelsa*).

Though I offered rewards and also had two orderlies out I was unable to obtain any nests.

H. F. FULTON, MAJOR.

DEHRA DUN, *March* 1914.

[Mr. J. Donald writes us that this shrub is probably *Prinsepia utilis* called in Jamsar 'Bhekoii' or 'Bhek' or in Gharwal 'Bhekal' or 'Bhekar.'—EDS,]

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## No. XX.—IMPERIAL SANDGROUSE (*PTEROCLES ARENARIUS*) IN CHITRAL.

I am sending you the enclosed skin of a bird which I shot here on the 15th March out of a party of three. I also put up a single bird on the 14th. It appears to me to be that of an Imperial Sandgrouse, and I would like to know if this bird has been recorded from Chitral. The Chitrali has no name for it and apparently does not know it.

For the last five or six days there has been a strong north wind blowing, but the weather on the whole has been good for the last two weeks.

H. D. STIRLING, CAPTAIN.

CHITRAL, 16*th March* 1914.

[The skin sent is that of an Imperial Sandgrouse, and as far as we know it has not been recorded from Chitral before. It has however been obtained by Colonel Biddulph in Gilgit and Major Stone in Kashmir and breeds in Afghanistan, so its occurrence in Chitral was to be expected.—EDS.]

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## No. XXI.—NOTE ON THE HABITS OF THE KALIJ PHEASANT.

It may be of interest to note that on 30th ultimo, I came across a cock Kalij pheasant (*G. horsfieldi*) looking after a flock of young a few days old. I saw no sign of the hen, though I watched the cock for several minutes. Probably she was absent looking for food. The cock was very aggressive and ran around demonstrating, often coming within ten yards of me. The chicks were hiding in the leaves, one within a few inches of my feet.

H. W. A. WATSON.

MOGOK, BURMA, 6*th April* 1914.

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## No. XXII.—BEWICK'S SWAN SHOT NEAR QUETTA.

I have to report that a female Bewick's Swan (*Cygnus bewicki*) was shot by Mr. A. Aitken at Khushdif Khan, about 40 miles from Quetta, on 17th December 1913. I think there can be little doubt about its identification, but I append its measurements as taken in the flesh and a painting of its head taken from the specimen by myself. The bird is now mounted in the Quetta Museum.

| Bewick's Swan (*C. bewicki*). | | | Whooper (*C. musicus.*) | | |
|---|---|---|---|---|---|
| Quetta Swan. ♀ | | Measurements of according to Dresser's "Birds of Europe." Female described as smaller. | Dresser Female smaller. | Baker Indian Ducks. | Blanford F.B.I. Female smaller. |
| Length .. .. | 44 | 46 | 60 | 52 | 60 |
| Height .. .. | 14 | .... | .. | 16·5 | .. |
| Wing .. .. | 19$\frac{3}{4}$ | 18·7 | 23·2 | 23·5 | 25 |
| Tarsus .. .. | 4 | 3·85 | 4·3 | 4 | 4·5 |
| Culmen .. .. | 3$\frac{7}{8}$ | .... | .. | 4·5 | .. |
| Bill from gape .. | 3·4 | 3·4 | 3·95 | .. | 4 |
| Expanse .. | 74 | .... | .. | 85 | .. |

R. MEINERTZHAGEN, Capt.,
Royal Fusiliers.

Staff College, Quetta, 26*th March* 1914.

[ Unfortunately we are unable to produce Capt. Meinertzhagen's beautiful sketch.—Eds.]

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## No. XXIII.—BRONZE-CAPPED TEAL (*EUNETTA FALCATA*) AT ROORKEE.

It may interest you to hear that I killed two Bronze-capped Teal (*Eunetta falcata*), male and female, here on the 12th February. They were flying with other duck, chiefly wigeon and pintail, and I shot them without knowing what they were till I picked them up.

R. G. BIGNELL, Lieut.

R. A. Mess, Roorkee, 14*th February* 1914.

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## No. XXIV.—LATE STAY OF SNIPE.

With reference to the late stay of snipe in the Central Provinces noted on by Mr. C. R. Pitman in Volume XXII, No. 3, page 632, in this Province I have often wondered how it is that a certain number of snipe are to be met with every year, very often in most unlikely spots far late in the season. Here one is not surprised to see odd snipe on the banks of the Irrawaddy above Myitkyina late in April as it gives the impression of stray birds returning leisurely to their breeding haunts, but in both Lower and Upper Burma I have time and again seen odd birds as late as the middle of May.

The usual snipe season in Lower Burma is from say 20th August till end of October or early November in favourable rainy seasons; in others when the rains cease rather abruptly they start for Upper Burma towards the end of October. Still a number of snipe do remain behind, *e.g.*, twenty-five couple were shot by two guns two days ago, 21st February, though as stated above, the season in Rangoon was over nearly four months ago. I have shot as many as 15 couple at the end of March in Lower Burma. In Upper Burma the season is from November till end of February but in one or two places in Kyaukse District I have seen enough snipe on flooded fields at the end of April to afford a good days shooting. I have shot two woodcock in March, one in Upper Burma, the other in the Northern Shan States.

G. H. EVANS, Colonel.

Rangoon, *25th February* 1914.

## No. XXV.—WHITE SNIPE.

During twenty-five years' residence in Burma I have seen five so-called white snipe. Some years ago I shot one in the Sagain District, and sent the skin to the Society's Museum. Since then I have shot two others, one in the Shwebo and the other in the Kyaukse District. A fourth bird I saw was, if I remember rightly, shot by Colonel Eyre of the Commission near Sagaing. Until quite recently I never heard of one being seen in Lower Burma. Mr. W. Perry brought me a specimen one evening which he had shot within a few miles of Rangoon. He gave me the bird which I took home, giving my servant instructions to put it in the ice box as I wanted to skin it in the morning. Being a good servant he thought he would save Master trouble so undertook the job himself. When I called for the snipe he produced it wrapped in paper and with his face wreathed in smiles, announcing that he had 'done finish skin.' My attempts at taxidermy are nothing to be proud of, but his proved to be decidedly worse. Mr. G. C. Shortridge, however, thought it was good enough to keep so took it away.

A white snipe getting up suddenly rather startles one, as the difference in colour is instantly appreciable. The first one I saw I straight away missed; however, I marked him down, followed up and did better next shot. Mr. Perry was so much surprised when his bird rose, he did not fire, but his curiosity being aroused he marked the bird and later secured him. There is nothing noticeable as regards flight. All the specimens I have seen to the best of my recollection have been fantails. I do not consider the change in colouration adds to their beauty. The general appearance conveys the impression that serious attempts had been made to wash out ordinary markings.

Are such birds occasionally shot in India?

G. H. EVANS, Colonel.

Rangoon, *25th February* 1914.

[The Society has received from time to time a number of these semi-albino and albino fantail and pintail snipe from different parts of India including one jack snipe.—Eds.]

## No. XXVI.—EGRET FARMING IN SIND.

(*With a plate.*)

In connection with the "Plumage Question" at present so much to the fore it will perhaps cause no little surprise to many to hear that the little Egret (*Herodias garzetta*) is now being bred and reared with marked success in captivity and on an extensive scale in many parts of Sind and that the

Mirbahars (the generic term by which the fisher-folk of the inland waters of the Province are known) are building up a lucrative trade in osprey feather plucked from the plumage of these egrets and that the operation is conducted without injuring the birds, in the same way as feathers are plucked from the ostrich.

During the course of residence on duty at the village of Ber in the Kamber Taluka of the Larkana District the writer spent some considerable time in investigating personally the *modus operandi* of the breeders and has thought it worthwhile to record the results of his investigations as the egret or white heron is regarded popularly as requiring most protection by the State against the depredations of man in pursuit of the beautiful osprey plumes, now so valuable a commodity in the world of fashion.

The village of Ber is situated on the edge of the Chango Lake or dhand in the Larkana District.

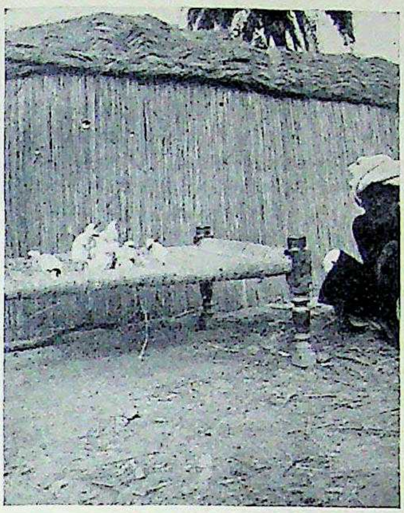
At a distance of about three hundred yards from the village and practically on the edge of the water, a colony of Mirbahars numbering some 200 men, women and children have their abode in reed huts. A feature which attracted the writer's attention, since his last visit to the village, was the recent erection in front of each abode of quadrangular structures of reed mats some 20′. 8′. 8′ resembling an ordinary poultry run. On obtaining entrance into one of these structures he found it contained at least three score pairs of full grown egrets in a state of freedom: there was a plentiful supply of perches for the birds, and the cage was tolerably clean. The birds appeared to associate in pairs, and met the intrusion with their usual hoarse cries. A liberal supply of food, consisting of small fresh water fish netted in the dhand, lay about in shallow earthern platters and the birds helped themselves to this at pleasure. The birds were fairly tame and allowed themselves to be seized by their owners without showing any fear. There were about twenty such cages in the village each containing about fifty birds on the average.

There was ample evidence to indicate that the birds breed freely in these conditions of modified captivity. Enquiries showed that under these conditions birds assume their nuptial plumage four times a year: twice in summer and twice in winter; the summer plumage is comparatively poor, nearly half that of the winter plumage.

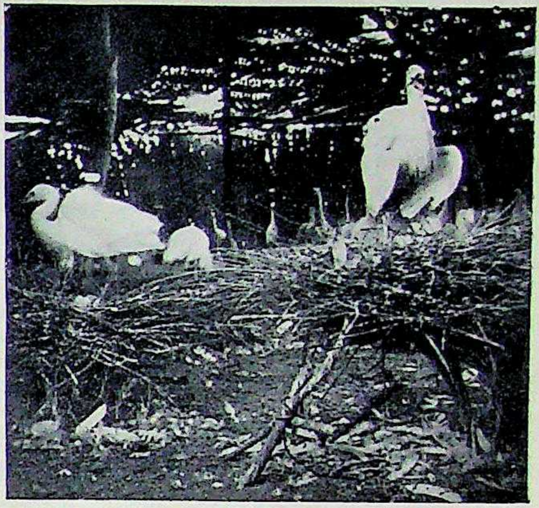
The breeding season commences early in March and continues up to the end of September. As soon as the breeding season begins the birds break up into couples: twigs are strewn about the cage and each pair of birds build a nest. The birds hatch their own eggs which are jealously guarded, the male bird invariably taking the place of the mother bird when she leaves the nest for food or exercise. The young are permitted to remain with the parent birds for about a week when they are removed and reared by hand: the couple meanwhile commence to breed again.

The number of times the birds breed during this period depends on the degree of vitality of each pair; eggs are laid never less than twice during the season and sometimes as many as four or five times; the number of eggs each time varies from three to five. It takes about 12 months for a bird to reach maturity.

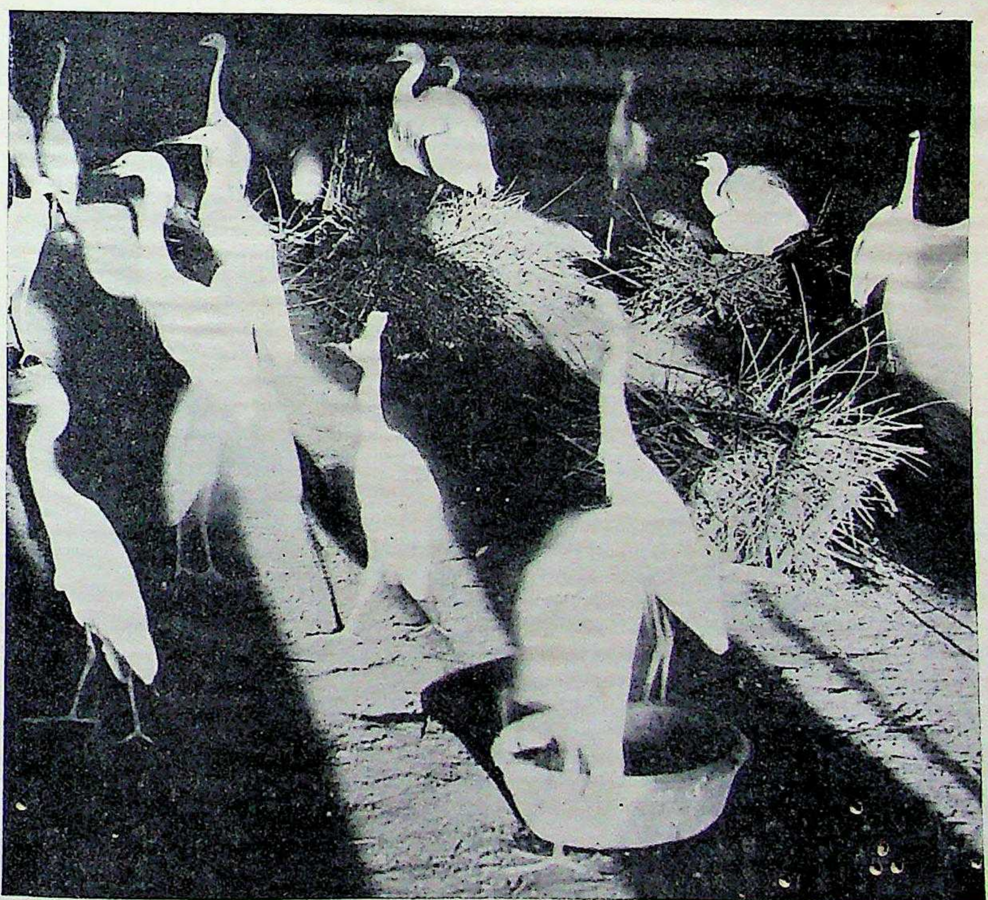
The plumes are made up into small brushes weighing about half a tola to a tola, and are taken to Sukkur and Karachi for sale. The prices realized range from 10 to Rs. 15 a tola: as each bird yields plumes seldom less than a tola in weight and often more during the year, it will be understood how lucrative a hobby egret-farming has become. The Sukkur merchants export the feathers to Calcutta whence they are no doubt smuggled out of the country to the European markets where prices ranging as high as £ 15 an ounce of feathers are realized.



A. Egret fledglings, 2 weeks' old.



B. Inside view of Egret colony shewing brooding birds.



C. Interior view of enclosure shewing nests and birds.

EGRET FARMING IN SIND.

Not only has a trade in the plumes been built up but the birds themselves now command a high market value; young birds three to four months old are sold at 10 to 12 per Rs. 100, full grown birds command as much as Rs. 100 per pair.

The ease with which the egrets are bred and multiply, the fruitful crop of plumes yielded by the bird and the high prices which the birds command are causing the industry to spread very rapidly in the neighbourhood of the inland waters of the Province of Sind and it may be predicted with safety that in a few years, if the demand for the plumes continues, every fishing village in the interior of the country will have its egret farm. Of course the trade in plumes of the birds of the egret and heron species has always existed in Sind but the methods formerly followed were quite different and the trade never attained such large dimensions. The practice followed till about three decades ago, was to snare the birds and destroy them for their plumage. On this being stopped, by executive orders of the then Commissioner in Sind Mr. (now Sir) Evan James, the practice of snaring the birds and keeping them in captivity was resorted to; but this led to the infamous custom of stitching up the birds' eyes with the object of preventing them from escaping. The latter practice is now rigorously suppressed by action under the Prevention of Cruelty to Animals Act and these orders have proved an important factor in the inception of the system of egret farming described in this note.

Arrangements are being made to obtain a pair of the birds for the Karachi Zoo.

In this connection a question bound to arise sooner or later is the necessity for the modification of the drastic Notification issued by the Government of India in 1902 which "prohibits the taking by sea or by land out of British India of skins and feathers of *all* birds other than domestic birds, except (*a*) feathers of ostriches and (*b*) skins and feathers exported *bona fide* as specimens illustrative of natural history."

The result of the Notification has been to create a large industry in the smuggling out of the country even in cases where destruction and cruelty to the birds concerned are not involved, of feathers that have a distinct commercial value: if bird-farming on humane lines for the sake of plumage is to be encouraged in India, these orders must be modified. Only the other day the Customs authorities at Karachi seized several boxes of peacock feathers which were being surreptitiously exported under a false declaration by a European Firm. These were confiscated and a fine imposed. Now it is well known that the peacock moults its train. The bird is regarded as sacred by a large majority of Indians and is seldom or never killed by them and the occasions on which it is shot by inexperienced European sportsmen have not infrequently led to collisions with the country people. In many other directions the necessity for the amendment of the orders in question could be indicated, so as to encourage instead of deterring the farming of birds whose plumage has a distinct marketable value.

GEORGE BIRCH,

KARACHI, *March 23rd*, 1914. Assistant Commissioner in Sind.

[Mr. Birch has sent us some specimens of the plumes and also some photographs of the Egrets in the 'farms', some of which are reproduced here.—EDS.]

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## No. XXVII.—A CURIOUS HABIT OF KITES AND CROWS.

Residents in Rangoon have a choice of two Golf Courses, one in Cantonments, the other situated at Mingaladôn some twelve miles out. On the former course I have not heard of crows being a nuisance to players. In a large city no doubt there is no lack of other means by which they can annoy people. Near the fifth hole there is a large tree (*Ficus religiosa*) and within 50 yards a barrack. From October till the rains begin, quite a number of the common variety of Kite take up their residence, roosting on the tree and on the ridge of the barrack roof. On several occasions a kite hovering about has on seeing a ball played on to or near the green swooped down and removed it. It is invariably a new or very clean ball that attracts attention. On the Mingaladôn course there are one or two Mango topes in the vicinity of some of the holes, and in these some jungle crows reside. One or more of these crows earned notoriety by making a business of watching players and when a ball was played, out flew a crow to where the ball landed, and if it met with his approval promptly carried it off. A crack player was annoyed at losing a hole apart from the loss of a ball, while an indifferent or bad player who with ease can lose a few balls on a round was furious to find that when he made a shot on which he could congratulate himself this wretch of a crow stole out and removed the ball. One crow in particular was blamed; how he was recognized as the culprit history does not relate, but the fact remains that at the time I speak of some 17 new balls had been taken. The rumour got about that the Honorary Secretary had a trained crow for the purpose of keeping him supplied with balls, and I fear he was submitted to a good deal of chaff and wished the golf course crow elsewhere.

One day we took a Collector's gun (·410) doubled up, while doing a round. In due course two crows became very attentive but may have been suspicious; however, a hole or two further on one became more interested and confidential and just when he was not thinking, he was bowled over. I understand the nuisance abated forthwith but I believe another crow has taken a ball or two since. One reads of queer collections sometimes discovered in crows nests, etc., it is rather a puzzle to think what could be done with such a number of golf balls. The removal of one would teach a crow it was useless for gastronomic purposes.

G. H. EVANS, Colonel.

Rangoon, 25th *February* 1914.

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## No. XXVIII.—*SIMOTES SPLENDIDUS* Gunth, IN BURMA.

In Volume XVIII of this Journal on pages 781-782, Major Wall summarises the records of this rare snake. I have to-day (14th February) received a Valentine in the shape of a fifth specimen, which is further a gravid female. The snake was brought to me this morning with a broken back by two small boys, who stated that they had just found it on the open turf between the armourer's shop and my house here at Pyawbwe. It was still moving slightly when they brought it in. The spot where it was taken is quite open short turf with a somewhat sandy soil overlying at a depth of about a foot, very stiff clay. There is no cover in the shape of bushes or long grass nearer than about 100 yards, but there are some open holes of an old "whiteants'" nest. It is probable, therefore, that it had been travelling by night and had reached the point where it was found, when daylight came and revealed it, though it may, of course, have emerged from the holes referred to.

The following notes on the specimen may be useful. Length 28¼ inches of which the tail is 3 inches. Costals in 21 rows anteriorly and at midbody, and 17 rows posteriorly. The steps occur first about ⅓ of the distance from midbody and secondly about ⅔ of the distance by the union of the 4th and 5th rows on the right and of the 5th and 6th rows on the left in both cases. There are 180 ventral shields, an undivided anal shield and 35 pairs of subcaudal ones. The most remarkable thing about the snake's appearance is the enlargement of the rostral shield, not only in its prolongation over the upper surface of the snout, but in its thickness and the way it appears to have been added after the rest of the snake was finished. It touches 8 other shields of which 4 are the curious internasals. The two median ones of these are very small, posteriorly angulate, and project backwards between the two præfrontal shields so as nearly to separate them. The other pair of internasals lie one on either side of the head, scarcely extending to the upper surface and are in contact with the rostral, both the nasals, the præfrontal and the median internasals. The single pair of præfrontal shields (note the aberrant case from Sagaing recorded by Wall and Evans) extend well over the sides of the head, where they meet the outer internasals, the posterior nasals, loreal, upper præocular, and on the upper surface the supraocular frontal and median internasals. The frontal exceeds its distance from the end of the snout and is equal in length with the parietals, which are broad and extend well over the sides of the head. The supraocular is large, but not so large as the frontal.

The horizontal diameter of the eye equals the distance from the anterior edge of the nostril, which is pierced in a somewhat downward direction between the juxtaposed nasals at the top of their suture. There is a single loreal almost rectangular and slightly deeper than long. There are also two præoculars, the lower (the subocular of Boulenger) being a small scale fitted into the angle of the 3rd and 4th supralabials, also two subequal postoculars followed by two temporal shields. The supralabials are eight, of which the 4th and 5th border the orbit and the 7th is the largest. Four infralabials touch the anterior sublinguals, and the 4th and 5th the posterior, which are rather more than half the length of the anterior ones.

The colour is creamy above: there are 13 large irregular blotches of brown with black edges on the body. The first of these is divided by a creamy vertebral line except anteriorly where the dark marking narrows, unites and runs forward on to the head as far as the frontal shield. The last of these blotches is exactly over the vent. The next one before it and the third one before it are only about half the size of the others, and are completely divided by the creamy vertebral line, which makes a deep impression in both anterior and posterior borders of all the rest. From the last blotch on the body a pair of black lines run back on either side of the vertebral line to the tip of the tail, and in four places these are distinctly thickened outwards making four more dark patches, of which the last is on the tip of the tail. Over the rest of the upper surface of the head, extending on to the labials but not covering them and between the blotches on the body and tail, except in the vertebral region there is a thick speckling of dusky brown. On either side beneath is a row of small brown spots, which begins some distance behind the head and does not reach the vent. The remainder of the lower surface, including the labial margins, is white, the rostral alone being speckled with brown.

The specimen contains six large ova, the largest of which measures 1·38 inches by 0·33 inch. The foremost of these reposes on the left side of the body with its anterior end opposite the 115th ventral shield from the head. The next is on the right overlapping the first. The remainder are disposed diagonally overlapping each other, their anterior ends being on the left and their posterior on the right. They are soft skinned, and their contents of a thick cream-like consistency showing no signs of development as far as can be seen without dissection. In one case only I noticed a circular, nucleus-like body which perhaps shows that segmentation has begun. My examination was, however, hurried and I have not examined the teeth. The mouth, when the specimen was brought in, was full of earth as if the snake's head had been held down very hard on the ground while it struggled. This is the second specimen from this district.

F. E. W. VENNING, CAPT.

PYAWBWE, YAMETHIN DISTRICT,
18*th February* 1914.

## No. XXIX.—OCCURRENCE OF CANTOR'S WATERSNAKE (*CANTORIA VIOLACEA*) IN THE ANDAMANS.

I have lately received a small adult specimen of this rare snake from the Andamans. The two specimens in the Indian Museum are from Amherst (Tenasserim) and Singapore. Two specimens are in the British Museum, one collected by Evans and me in Wakema (Lower Burma). The habitat of the second is not known. Theobald mentions one from the mouth of the Moulmein River. These are the only records I am aware of. Up to this it has not been recorded from the Andamans.

My specimen has 241 ventrals and 69 subcaudals, and is quite typical. There are 59 black bands on the body, and 18 on the tail. The maxilla has 11 teeth, the last 2 twice the length of the preceding, grooved anteriorly, and obliquely set. No gap separates these large fang-like teeth from the preceding. Palatine teeth 6. Pterygoid 14 to 15". Mandibular 15.

F. WALL, C.M.Z.S., F.L.S.,
MAJOR, I.M.S.

ALMORA, 25*th April* 1914.

## No. XXX.—A NEW SNAKE OF THE GENUS *TROPIDONOTUS* FROM THE EASTERN HIMALAYAS.

### *TROPIDONOTUS FIRTHI*, SPEC. NOV.

In 1907 in the records of the Indian Museum (Vol. I, p. 156), I remarked upon two specimens of *Tropidonotus* from Nepal, submitted to me by Dr. Annandale for identification. These I referred to the species *chrysargus*, noting differences which I considered at the time insufficient for the basis of a species apart.

Last year Major Firth sent me a single specimen of a *Tropidonotus* from Takdah in the Eastern Himalayas (circa 4,500 feet), which I also at first took to be an aberrant specimen of *chrysargus*. On preparing the skull I found the dentition widely different from that of *chrysargus*, and noted that the lepidosis agreed with the two Nepal specimens previously referred to. Lately I have had a chance of re-examining the two Nepal specimens and find the dentition agrees with the Takdah specimens. I propose to name the species after Major Firth, 2/10 Gurkhas.

*Description.*—*Rostral.*—Touch 6 shields, the rostro-nasal greater than the rostro-internasal sutures. *Internasals.*—Two, the suture between them two-thirds that between the præfrontal fellows; two-thirds the inter-naso-præfrontal sutures. *Præfrontals.*—Two, the sutures between them subequal to the præfronto-frontal. *Frontal.*—Touches 6 shields, the fronto-supraocular sutures twice the fronto-parietal. *Supraoculars.*—Length subequal to frontal, breadth half to three-fourth frontal. *Nasals.*—Divided, in contact with 1st or 1st and 2 labials. *Loreal.*—One-half the length of the nasals. *Præocular.*—One. *Postoculars.*—Three. *Temporals.*—One or two anteriorly. *Supralabials* 8, the 3rd, 4th and 5th touching the eye. *Posterior sublinguals* longer than interior, in contact with the 5th, 6th and 7th infralabials. *Costals.*—Two headslengths, behind head 19, midbody 19, two headslengths before vent 17. In the reduction from 19 to 17 the 4th row is absorbed into the 3rd or 5th keels present, in all rows posteriorly. *Ventrals.*—173 to 199. *Anal.*—Divided. *Subcaudals.*—80 to 88 divided.

*Colour.*—Olive-brown or olive-green dorsally with 6 series of indistinct pale roundish spots arranged quincuncially, the median most indistinct. Head dark olive green, or brown above. A white moustache on the upper lip to behind the gape where it may or may not meet a whitish lateral nuchal streak. A small round pale spot on each parietal near the middle, and close to the inter-parietal suture. Chin heavily powdered with black. Belly yellowish (whitish ?) heavily powdered laterally, the powdering increasing towards the median line posteriorly.

The differences between *chrysargus* and *firthi* are as follows, but as it is extremely probable that specimens of both are included under the former name by Mr. Boulenger in his Catalogue, I give the characters present in 12 specimens of *chrysargus* in the Indian Museum—all from Tenasserim—including the skull of a Tenasserim specimen in my collection :—

| | Ventrals. | Subcaudals. | Labials. | Labials touching eye. | Maxillary teeth. | Palatine teeth. | Pterygoid teeth. | Mandibular teeth. |
|---|---|---|---|---|---|---|---|---|
| *firthi* .. .. | 173-199 | 80-88 | 8 | 345 | †18-19 | 12?-13? | 19?-21? | 21 ? |
| *chrysargus* .. | 156-166 | 91-102 | *9 | *456 | †35-37 | 20 ?-23 | 38 | 38-40 |

* 10 Labials, the 5th, 6th and 7th touching the eye in one specimen on the left side.

† In both species there is a gap at the back of the maxilla followed by two enlarged teeth.

F. WALL, C.M.Z.S., F.L.S.,
MAJOR, I.M.S.

ALMORA, 25*th April* 1914.

## No. XXXI.—A NEW SNAKE FROM BALUCHISTAN.

### *DIPSADOMORPHUS JOLLYI.*

Our Society has lately received through Captain Jolly, I.M.S., from Kacha Thana, Baluchistan, among other snakes, a single specimen of the genus *Dipsadomorphus* that deserves recognition as a species new to science. Though the head is rather badly damaged, the lepidosis on both sides is open to accurate observation. I propose to associate it with the name of its discoverer.

*Description.*—*Rostral.*—Touches 6 shields; the rostro-nasal and rostro-internasal sutures subequal. *Internasals.*—A pair; the suture between them about $\frac{1}{2}$ to $\frac{3}{5}$ that between the præfrontal fellows, and about $\frac{3}{5}$ the internaso-præfrontal sutures. *Præfrontals.*—A pair; the suture between them greater than the præfronto-frontal. *Frontal.*—Touches 8 shields; the fronto-supraocular sutures subequal to the fronto-parietals. *Nasals.*—Divided; in contact with the 1st and 2nd supralabials. *Loreal.*—One, touching the eye beneath the præocular.

*Præocular.*—One, just touching the frontal. *Postoculars.*—Two. *Temporals.*—Small and scale-like. *Supralabials.*—8, the 3rd, 4th and 5th touching the eye. *Infralabials.*—6; the 5th and 6th touching the posterior sublinguals. *Sublinguals.*—Two pairs. *Costals.*—Two headslengths from the head 25, in midbody 25, two headslengths before the vent 17. The vertebrals feebly enlarged, the breadth less than the length. *Ventrals.*—268. *Anal.*—Entire. *Subcaudals.*—7. The tail is mostly missing.

Length about $22\frac{1}{2}$ inches, the stump of the tail $2\frac{5}{8}$ inches.

*Colour.*—Dirty buff with the following very distinct, but ill-defined, blackish marks dorsally. A series of short crossbars down the back involving about 4 scales in the length of the snake anteriorly, 3 posteriorly, and separated by intervals about one scale long (often parts of two scales). Two series of costal spots alternating with one another, and the upper alternating with the vertebral bars.

Head greyish with no postocular, occipital, or nuchal marks. Belly uniform blackish.

The anterior palatine teeth are enlarged but not very markedly so.

It seems to resemble *D. cynodon* in its lepidosis more closely than the other previously described species, but is very distinct in having the vertebrals feebly enlarged, and the loreal in contact with the eye.

F. WALL, C.M.Z.S., F.L.S.,
MAJOR, I.M.S.

ALMORA, *3rd January* 1914.

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## No. XXXII.—REMARKS TO SHOW THAT THE SNAKE HITHERTO KNOWN AS *ZAMENIS MUCOSUS* HAS BEEN MISPLACED, AND SHOULD BE INCLUDED IN THE GENUS *ZAOCYS*.

In my popular paper on the Dhaman (*Zamenis mucosus*) in this Journal (Vol. XVII, p. 271), I remarked on a peculiarity in the absorption of the scale rows. On examining a specimen of this snake, we find that just behind the middle of the body (very rarely before) the scale rows which up to this point number 17, reduce to 16 by the absorption of the vertebral row into the uppermost row on the left side. Later the rows further reduce to 14 or 12, by the absorption of the 3rd row above the ventrals on each side. In no other snake with which I am acquainted in Asia from Persia to Japan is a similar peculiarity to be seen. The scale rows in all other species except those of the Genus *Zaocys* being in odd rows in the whole bodylength, whether the rows reduce in number or not. In the Genus *Zaocys* however, the rows are in even numbers. The Genus is a small one which comprised but six species when Mr. Boulenger's Catalogue appeared (Vol. I) in 1893. I have had opportunities of examining, but three of those six species, *viz.*, *Z. dhumnades* from China, *Z. nigromarginatus* from Assam and *Z. tenasserimensis* from Tenasserim. In all these species I find the vertebral row is absorbed into the uppermost row on the left side shortly behind the parietal shields, and from this point the rows are in even numbers. In other words the same remarkable absorption occurs that we see in *Zamenis mucosus* only it is in the neck instead of about midbody. In the three *Zaocys* referred to the scale rows further reduce to 14 by an absorption of the 3rd row above the ventrals.

Anyone familiar with *Zamenis mucosus* in India, a very common snake, would mistake the Chinese *Z. dhumnades* for it, as I did myself. The similarity in the two species in growth, bodily conformation, relative length of tail to body, in every scale peculiarity, as well as in colour and markings is very striking. Only careful attention to lepidosis would show the distinction between the two.

A reference to Mr. Boulenger's Catalogue (Vol. I, pp. 374 and 379) shows that there is an extremely close agreement in the characters of the genera *Zamenis* and *Zaocys*, in fact, the one point of difference one can discover is that the maxillary teeth in the former vary from 12 to 20, whereas in the latter they range from 20 to 33. Now I have six skulls of *Zamenis mucosus* in my collection and find that the maxillary teeth number from 20 to 24, so that the dentition on Mr. Boulenger's representation accords with that of *Zaocys* rather than *Zamenis*. I have skulls also of *Zaocys dhumnades* and *Z. nigromarginatus* which when compared critically with those *of Zamenis mucosus* reveal no differences that justify their being referred to different genera. The dentition of the three species is as follows:—

| Species. | maxillary. | palatine. | pterygoid. | mandibular. |
|---|---|---|---|---|
| Z. mucosus .. .. | 20—24 | 14—18 | 21—24 | 17—22 |
| Z. dhumnades .. .. | 23—25 | 19—20 | 25 | 25—26 |
| Z. nigromarginatus .. | 24—27 | 18—19 | 20—21 | 21—25 |
| Z. tenasserimensis .. | 26 | .. | .. | .. |

I think hardly any herpetologist will disagree with my opinion on the fact herein specified, that *Zamenis mucosus* should, in future, be known as *Zaocys mucosus.*

The change of an old established name for a common species with which we have grown familiar, is regrettable from every point of view. The fault lies with our systematists however, who group together species whose position is dubious, without even placing a query after the generic name. If skull characters are to be made the basis of classification then no systematist should fix the Genus of any species until he has skulls of every species.

Where skulls are not available, the generic name should be given dubiously in the text books which are supposed to guide us.

F. WALL, C.M.Z.S., F.L.S.,
MAJOR, I.M.S.

ALMORA, 12*th February* 1914.

## No. XXXIII.—ARE THE SNAKES *OLIGODON TRAVANCORICUS* (BEDDOME), AND *O. VENUSTUS* (JERDON) ENTITLED TO SPECIFIC DISTINCTION ?

Whilst examining snakes in the British Museum collection in 1912 I was much struck with the close resemblance between specimens of Beddome's

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*Oligodon travancoricus* and Jerdon's *O. venustus*. With the latter I am very familiar. I examined specimens of each, side by side, and failed to discover any reason for separating the two. Turning to Mr. Boulenger's Catalogue (Vol. II, 1894, pp. 235 and 236), the only differences are apparently as follows:—

| | *travancoricus.* | *venustus.* |
|---|---|---|
| (1) | The frontal shield is shorter than the parietals. | The frontal shield is as long as the parietals. |
| (2) | 3 infralabials touch the anterior chin shields. | 4 infralabials touch the anterior chin shields. |
| (3) | Dorsally there are bars. | Dorsally there are paired spots, usually united mesially. |
| (4) | *Habitat.*—Travancore Hills. | *Habitat.*—South West India. |

With regard to the first point I found that in one of the three specimens of *travancoricus* the frontal was fully as long as the parietals. The contact of the infralabials and anterior chin shields is not very constant in many species of this genus.

The dorsal mark in *venustus* are subject to considerable variation, the degree to which the spots are separated or confluent, as they are in other species, notably *O. subgriseus*. In the specimens of *travancoricus* indentations in the cross bars mesially and laterally are as pronounced as one sees in some specimens of *venustus*. Finally the habitat of *travancoricus* is contained within that of *venustus*. I think there can be little doubt that *travancoricus* has no claims to be considered distinct from *venustus*.

F. WALL, C.M.Z.S., F.L.S.,
MAJOR, I.M.S.

ALMORA, 25*th February* 1914.

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## No. XXXIV.—ARE NOT THE SNAKES *SIMOTES THEOBALDI* (GUNTHER) AND *SIMOTES BEDDOMII* (BOULENGER) ONE AND THE SAME SPECIES?

In Mr. Boulenger's Fauna of British India, Reptilia and Batrachia (1890, p. 314) a snake is described under the title *Simotes beddomii*, which I cannot dissociate from Gunther's *Simotes theobaldi* for the following reasons. I have examined the two type specimens (the only specimens known) of *Simotes beddomii* in the British Museum, and being familiar with *S. theobaldi*, at once remarked upon the similarity between the two. A comparison of the two supposed species failed to show me any difference between them worthy of remark. In Boulenger's Catalogue (Vol. II, 1894) both are figured on plate IX, and the striking similarity between them is very noticeable. The descriptions of the two on pages 229 and 230, critically examined, show differences as follows:—

| *beddomii.* | *theobaldi.* |
|---|---|
| Ventral, 167 to 168. | Ventrals 171 to 180. |
| Subcaudals 43 to 46. | Subcaudals 34 to 42. |
| Tail $\frac{1}{6}$ to $\frac{1}{7}$ bodylength. | Tail $\frac{1}{12}$ to $\frac{1}{13}$ bodylength. |
| A few scattered ventral spots posteriorly. | No spots on belly or square black spots posteriorly. |
| *Habitat*—Wynad. | *Habitat*—Burma. |

I have now seen at least 15 specimens of *Simotes theobaldi* from Burma with a range of ventrals from 164 to 180, and a range of subcaudals from 30 to 42. The trifling differences in the ventral shields recorded in Mr. Boulenger's work therefore disappear.

The relative length of the tail to the body differs remarkably in the sexes of many species of *Simotes* and *Oligodon*, and it is noteworthy in this connection that the single adult *beddomii* is a ♂ and that 3 of the 4 specimens of *theobaldi* referred to by Boulenger were ♀. The disparity in this appendage in the two supposed species is probably of sexual import. Next while some specimens of *theobaldi* have square spots on the ventrals, others are unspotted, whereas in *beddomii* there are a few scattered spots on the belly behind. I have however had at least one specimen of *theobaldi* from Thayetmyo, Burma, with a few spots scattered irregularly on the hind belly. Lastly we come to habitat. In an article on another snake, *viz.*, *Simotes splendidus* in this Journal (Vol. XVIII, p. 782) I furnished very strong arguments for assuming that the habitat of the type of that species was Burma and not Wynad as reported by Colonel Beddome.

When I sent a specimen of *splendidus* from Burma to the British Museum in 1908 Mr. Boulenger in acknowledging the specimen wrote to me as follows:—" The habitat of the *Simotes splendidus* is very interesting. I wonder now whether Beddome's locality (Wynad, in his own handwriting) is trustworthy." It is very significant that no less than eight species now known to be denizens of Burma and Tenasserim, are only known from Peninsula India on the authority of Colonel Beddome who presented specimens to the British Museum with labels bearing the name of some locality in S. India! After what has been said of *S. splendidus* it is significant that the two type specimens of *beddomii* should be labelled from Wynad in Colonel Beddome's handwriting.

On the facts represented above I have little hesitation in suggesting that these two types of *beddomii* were collected in Burma, and inadvertently mixed with Colonel Beddome's South Indian collections. Once this possibility is admitted I venture to think that the types of *beddomii* will be identified as typical specimens of *theobaldi*.

F. WALL, MAJOR, I.M.S.,
C.M.Z.S., F.L.S.

ALMORA, *24th February* 1914.

## No. XXXV.—SIAMESE FIGHTING FISH (*BETTA PUGNAX*).

Mr. F. H. Stone has a note in Volume XXII, No. 3, page 632, on this wonderful little fish. I have on several occasions kept several of these fishes. Each fish was kept in a white gin bottle and the following diet given, fine bread crumbs, a grain or so of boiled rice, for a change small morsels of earthworms, and as a real treat a few mosquito larvæ. The bottles must be kept at some distance apart in order that the fish may not see one another, for if they should do so they are kept in a perpetual state of irritation. When unperturbed they, as Mr. Stone remarks, look like very ordinary little fishes, but place two in a large glass salad bowl and then the fun begins: up goes the dorsal fin, each puffs himself out with pride as much as he can, at the same time displaying iridescent colours. With this fine play of colours their anger seems to have arrived at about the maximum. The swelling of the pouches from the lower part of the gills as noted by Mr. Stone imparts quite a bull-dog aspect to the fish. They are full of pluck and go for one another in real earnest, biting small pieces out. The defeated fish usually sinks to the bottom of the bowl, seems disinclined to rise, and gradually, unless pressed, takes on his normal appearance, the victor generally swims above swaggering about as if quite conscious of the fact that he is 'top dog.' We never allowed them to have more than two or three rounds, having been told that if we did so the defeated fish would be killed. I also received instructions as to the treatment of beaten fish, which is to keep them in muddy or discoloured water for some few days; this serves the double purpose of healing their injuries and concealing their shame. They will go for little fish of the goldfish type without any hesitation and keep them swimming hard. They are most interesting creatures and if carefully looked after regarding changing the water, not keeping them for a long time in excessive light, etc. they live for some time. I understand in Siam, especially in Bangkok, fighting with these little fish is a popular pastime and much money changes hands. There is always some one with an undefeated fish and lots of owners ready to attempt to lower his colours.

G. H. EVANS, Colonel.

Rangoon, 25th *February* 1914.

## No. XXXVI.—NEW SPECIES OF INDIAN GRASSHOPPERS BELONGING TO THE GENUS *HIEROGLYPHUS*, Krauss, AND THE GENUS *HIEROCERYX*, Bol.

(*With an Illustration.*)

For several years past, the common Rice Grasshopper (*Hieroglyphus banian*, Fabr.) has been an object of study in the Entomological Laboratory of the Mysore Agricultural Department. The main practical results of this study have already been published as Bulletin No. 1, Entomological Series of this Department. In connection with the study of the specific characters of this insect, I had the opportunity of examining the specimens contained in the Indian Museum as well as those in the Pusa collection, and soon became convinced that at least two distinct species had been included under this name. This view was strengthened particularly by the fact that, although a micropterous form of *H. banian* has been recorded and figured by Lefroy (Indian Insect Pests, p. 120., Indian Insect Life, p. 87.), we have never seen such a form either in badly infested paddy fields extending over thousands of acres, or among the hundreds of individuals reared in the Insectary here.

The micropterous form, moreover, was seen to show decided points of difference from *H. banian*, especially in the black markings on the prothorax and a long-winged form was found among the specimens included under *H. banian*, which possessed similar markings.

To settle the point, I obtained through the kindness of Mr. Y. Ramachandra Rao, Assistant Entomologist, Madras Department of Agriculture, specimens of the micropterous form of *Hieroglyphus* along with specimens of the long-winged form collected at the same time, which apparently belonged to the same species. These, along with a second and distinct micropterous form reared from nymphs collected at Anavatti, Mysore State, were sent to Prof. Ignacio Bolivar, Madrid, for identification.

As I had anticipated, Prof. Bolivar reported that two distinct species have hitherto been placed under *H. banian*. One of these is the real *H. banian* for which, as far as I am aware, no micropterous form has yet been found. The other is a new species *Hieroglyphus nigro-repletus*, Bol., which possesses both a normal and a micropterous form.

This new species has been described by Prof. Bolivar in the Trabajos del Museo de Ciencias Naturales, No. 6 of 1912, as follows:—

*Hieroglyphus nigro-repletus*, sp. nov.

Robustus, virescens, in sicco pallide badius. Costa frontalis lata sulcata versus fastigium indistincte angustata cum verticem distincte rotundato conjuncta. Fastigium transversum, marginibus anterioribus crassis,

080712

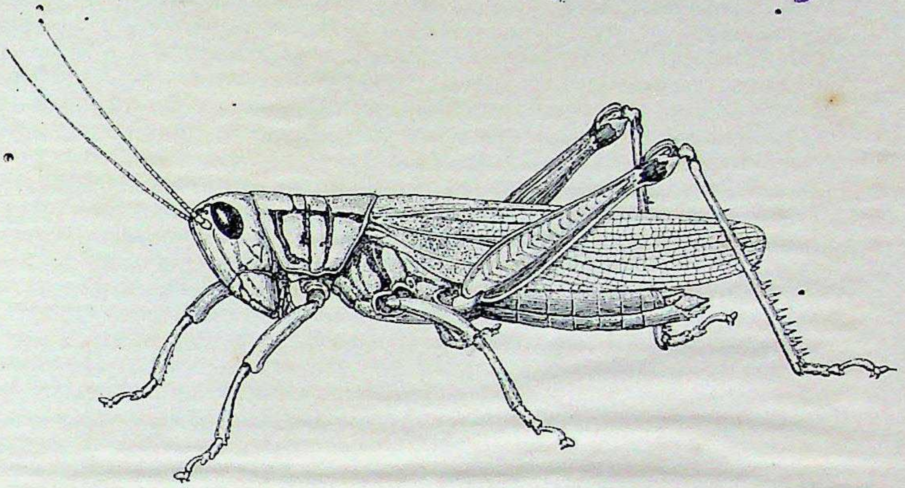

FIG. 1.—Hieroglyphus nigro-repletus, Bol female, long-winged form

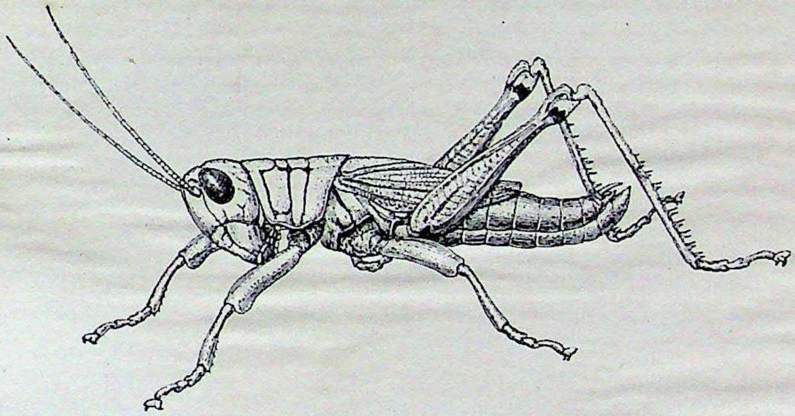

FIG. 2.—Hieroglyphus nigro-repletus, Bol. male, micropterous form.

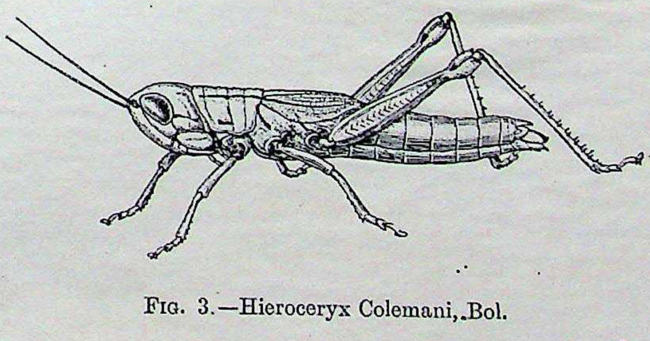

FIG. 3.—Hieroceryx Colemani, Bol.

impressopunctatis, inter oculos utrimque carinula instructum. Pronotum compressiusculum, dorso distincte planatum, postice obtusangulatum, sulcis in dorso leviter impressis, vel sub-oblitteratis et concoloribus, in lobis profunde impressis atque late nigro-repletis, pictura nigra sulcis superne ad loco carinarum lineis continuis in metazona retrorsum divergentibus formans, inferne inter sulcos primos linea nigra instructa, lateribus pectoris suturae late nigro pictae, prozona quam metazona haud sesqui longiora, postice obtusangula. Elytra apicem femorum valde longiora, lata, maxima parte hyalina, basi striga nigra, venae ulnariae nec non ramis radialibus nigris, areis radiali atque inter ulnari vena intercalata instructis. Alae amplæ, venis fere omnibus nigris. Spina prosternali acutissima. Lobi mesosternales fere æque longi ac lati, intus rotundato subangulati, spatio "X" formi medio angusto, antice posticeque valde ampliati sejuncti. Lobi metasternales breviter contigui. Lobi mesosternales in ♀ transversi inter se leviter distantes; mesosternales haud contigui. Pedes antici ♂ fortiter incrassati. Femora postica capitulo geniculari apice loborum excepto nigro vel per exceptionem, apice dorsali tibiarum anguste nigro marginato et basi capitulo intus extusque fascia transversa nigra superne interrupta. Tibiae omnes coeruleae, condylo posticarum pallido, annullo basali, linea inferiori longitudinali nec non calcaneis nigris. Segmentum anale ♂ late arcuato-sinuatum. Lamina supraanalis medio sulco percurrenti medio coarctato, basi utrinque carinula abbreviata obtuse posita, marginibus arcuatis prope apicem sinuatis. Cerci ante apicem subito et breviter subulati, superne subangulariter lobati et intus breviter tuberculati. Lamina subgenitalis breviter sed acute conica. ♀ Lamina supraanalis lanceolato-triangularis medio sulcata, sulco transverse interrupto. Cerci acuti graciles. Valvulæ inferiores ovipositoris brevissimæ extus basi fortiter bidentatæ ♂ ♀.

Long. corp. ♂ 43; pron. 9, 5 elytr. 37; fem. post. 20 mm.
" " ♀ 44; " 10; " 34; " " 22 "

*Loc.* Bombay. Col. del Museo de Madrid (de mi coleccion); Hadagalli, Bellary, Madras Presidency, sent by Dr. Coleman.

Forma *brachytera*.

Statura minore. Elytra valde abbreviata unicoloria, tantum basi striga fusca abbreviata, lanceolata, ante medium latissima prope apicem subito angustata marginibus antico posticoque sinuatis apice anguste rotundato. Lineis nigris lateralibus pronoti pone sulcum typicum haud continuatis.

Long. corp. ♂ 38; pron. 9, 5; elytr. 17; fem. post. 19 mm.
Lat. media elytrorum, 6, 2 mm.
*Loc.* Bombay et Bellary: India.
My collection and sent by Dr. Coleman.

Prof. Bolivar's description of the micropterous form requires a slight qualification. The statement given in the last line that the lateral black line on the pronotum does not extend behind the sulcus typicus is not always true. We have a short-winged female in our collection in which the lateral black line extends to the posterior border of the pronotum and in fact the black markings on the pronotum are practically identical with those he has described for the normal form. Lefroy's figure, which is also of a female, shows the same characteristics.

In addition to the Latin description, Prof. Bolivar gives a comparison between *H. banian* and *H. negro-repletus*, Bol., which I here synopsize from the Spanish original.

1. Colour. There is marked difference in the markings on the prothorax and sides of the thorax.

2. Size. *H. nigro-repletus* is more robust and shows no constriction in the prothorax. The anterior femora (in the male) are much larger, the

elytra much broader and their colour diversified by black nervations in the new species.

3. The mesosternal lobes are nearly straight along the inner edge in *H. banian* and leave a larger space between them than in *H. nigro-repletus*; in the latter species this space takes the form of an "X" widened at the anterior and posterior ends.

4. The metasternal lobes are approximated over a greater length in *H. banian* than in *H. nigro-repletus*, almost joining in the form of a suture.

5. The anal organs differ much in the two species. The two oblique wing-like lobes which are at the base of the supra anal plate in *H. nigro-repletus* are lacking in *H. banian*; the cerci in *H. banian* ♂ are bifid in *H. nigro-repletus* ♂ are simple; the subgenital plate in *H. banian* ♂ is very long and conical in shape, in *H. nigro-repletus* it is short; the valves of the ovipositor, in *H. banian* ♀ are long and narrow, the inferior ones having at the base two teeth of which one is very small; in the ♀ of the new species, the valves are short and the teeth at the base of the inferior ones are very strong and stout.

The accompanying figures 1 and 2 show a normal female and a micropterous male respectively of the new species *H. nigro-repletus*. A comparison of these figures with corresponding figures or specimens of *H. banian* will at once reveal the marked differences existing between the two species.

Along with the specimens of this new species of *Hieroglyphus*, further specimens of another micropterous form, which was found in small numbers associated with *Hieroglyphus banian* in the paddy fields at Anavatti, were sent to Prof. Bolivar. He has erected a new genus *Hieroceryx* to include this form and another Indian species to which Saussure had given the manuscript name of *Hieroglyphus bilineatus*; this latter species I have not seen. As Bolivar's descriptions are inaccessible to most Indian workers, I give them here in full, together with a synopsis of his comments.

Gen. *Hieroceryx* nov.

Corpus teres, compressiusculum. Frons valde obliqua cum vertice angulato conjuncta, costa tota sulcata ad fastigium angustiora. Fastigium transversum, in ♀ valde transversum, impressum, intervallo oculorum articulo primo antennarum latiore, in ♀ duplo latiore. Carinis lateralibus frontis inter antennas et oculos sinuatis et subinterruptis. Pronotum teres, compressiusculum, antice late rotundatum, postice obtuse angulatum carina media indistincta vel subtiliter instructa; sulcis transversis subtilis concoloribus; lobi laterales, elongati, subtus obtuse angulati, postice prope angulum posticum subsinuati. Elytra in species cognita abbreviata, lanceolata intus inter se tangentia. Alae brevissimæ. Prosternum spina acuta, ab antico posticoque compressiuscula. Lamina sternalis elongata, lobi mesosternales trapezoidales intus angulati, tangenti ♂ vel subtangenti ♀, spatio intermedio fortiter "x" formi, metasternales pone foveolas tangenti. Pedes antice breves in ♂ incrassati. Femora postica elongata: geniculæ apice carina dorsali subindistincte producta; lobi geniculares apice obtuse acuminati. Tibiae posticae cylindricaepræter spinas apicales intus extusque 9-10 armatæ, spinis intermediis latere interno sensim majoribus. Tarsi graciles articulis primo tertioque subaeque longis. Abdomen segmento anali rubusto. Lamina supraanalis trigona apice acute producta. Cerci ♂ lobati, ramosi. Lamina subgenitalis breviter conica. Lamina supraanalis utrimque sinuata basi sulcata, apice trigona, incrassata. Valvulae ovipositoris sinuatae, inferiores basi dente magno instructae.

This genus is close to *Hieroglyphus* Krauss. The following features however distinguish it from the latter.

1. The general appearance is different, resembling more the genus *Oxya*, Serv.

2. The lateral lobes of the prothorax although attached vertically give rise to no dorsolateral ridge as in *Hieroglyphus.*

3. The elytra and wings are very short.

4. The prosternal tubercle is small and antero-posteriorly compressed.

5. The mesosternal lobes touch in the medium line to form a space in the shape of an "x" both in the ♂ and the ♀, the space being smaller in the latter.

6. The cerci of the ♂ are extraordinary in form and complete the distinction from the genus *Hieroglyphus*. These organs which in the ♀ are very short and conical, in the ♂ are large and branched to form two lobes. The first lobe is concave posteriorly and the second lobe which arises from the base of the first is applied to it along its concave side. In addition, at the base of the two lobes, there is a third prolongation or appendage directed upwards. This plurilobal form of the cercus is undoubtedly a generic character, its detailed structure varying with the species.

*Hieroceryx bilineatus*, Sauss, *in litt.*

Pallide virescens, sicco stramineus, capite infra oculos linea nigra obliqua. Pronotum dorso nigro-bilineato lobis lateralibus sulco medio nigro, inferne colore nigro antrosum breviter producto; dorso impresso-punctato, metazona brevissima, parte pronoti inter sulcos posticos sita vix longiore, margine postica obtusissime angulata. Elytra dimidio femorum vix attingentia apicem versus angustata, apice oblique rotundata, ♀ subacuminata; venis radialibus nigris, usque ad medium approximatis, pone medium divergentibus, area internomedia venis transversis parallelis instructa. Femora postica superne apice angustissime nigro-marginata, geniculae basi intus extusque nec non basi loborum macula parva nigra ornatae. Tibiae posticae dilute coeruleae; condylo lineaque latere inferiore nigris. Lamina supraanalis ♂ marginibus crassis, subreflexis, ante apicem sinuatis, apice lobo parvo trigono producta, medio basi subsulcata. Cerci trilobati, lobo primo extus convexo, magno; lobo secundo erecto apicem versus valde ampliato; lobo tertio angusto subtereti, erecto. Abdomine subtus, segmentis pilosis, lamina subgenitalis conica parva. Segmentum anale ♀ postice arcuato, lamina supraanalis basi sulcata, lateribus depressis, ante apicem sinuatis apice obtuse triangulariter producta subincrassata ♂ ♀.

Long. corp. ♂ 22; pron. 3, 5.; elytr. 6, 5; femor. post. 11mm.
" " ♀ 36; " 7, 8; " 10; " " 17mm.

Loc. Indias orientales. H. de Saussure. "Col. del Museo de Madrid (de mi coleccion)"

*Hierocery.x colemani*, sp. nov.

Hier. bilineato colore et forme valde affinis sed fronte a latere visa convexa, distincte breviore, carinis frontalibus pallidis, oculis multo brevioribus haud duplo longioribus quam latioribus; pronoto metazona spatio inter sulcos posticos vix longiora; lobis deflexis longioribus elytra breviora, venis radialibus tantum prope apicem divergentibus, area internomedia indistincte venulosa. Lamina supraanalis trigona, levia, basi subindistincte sulcata ♀.

Long. corp. ♀ 34; pron 6; elytr, 8; fem, post. 21mm.

Loc. Anavatti, Dr. Coleman collegit.

This species was described from female specimens alone. Fig. 3 gives an accurate representation of it.

LESLIE C. COLEMAN,
DIRECTOR OF AGRICULTURE IN MYSORE.

BANGALORE, *February* 1914.

## No. XXXVII.—NOTES ON BUTTERFLIES.

*Papilio nomius*, Esper.—Mr. T. R. Bell, writing about this butterfly, at page 755 of Vol. XXI of this Journal, gives its foodplant as *Saccopetalum tomentosum* and quotes Dr. K. Jordan as saying that *Polyalthia longifolia* is eaten by the larvæ also. It may be of interest to know that I have recently found this butterfly breeding on this latter tree. About the first of this month, I noticed a female of *P. nomius* depositing eggs all over a large tree of *P. longifolia* which was coming into new leaf. I secured a fresh sprout with an egg on it and put it in water in a breeding-box. The sprout withered, however, and I did not attempt to get more eggs. On the 4th instant I got two caterpillars on the same tree, and the next day got a third caterpillar. I could, no doubt, have got many more if I had tried, but in view of Mr. Bell's statement that the great majority of the chrysalides lie over for ten months or more until the following year, I remained satisfied with the three larvæ I had got. These pupated within 2 or 3 days of my putting them into the box. On 15th instant one butterfly emerged and on the 17th the other two—all three perfect specimens. The unusual spell of stormy weather, which we are experiencing just now in what should ordinarily be a really hot month is, no doubt, responsible for all 3 pupae "hatching out" so quickly.

*Junonia almana*, Linn.—On 14th instant, my Collector brought me in a perfect specimen of the west season form of this butterfly, the result, no doubt, of the present strange weather.

W. M. CRAWFORD,

Sambalpur, *20th April* 1914.

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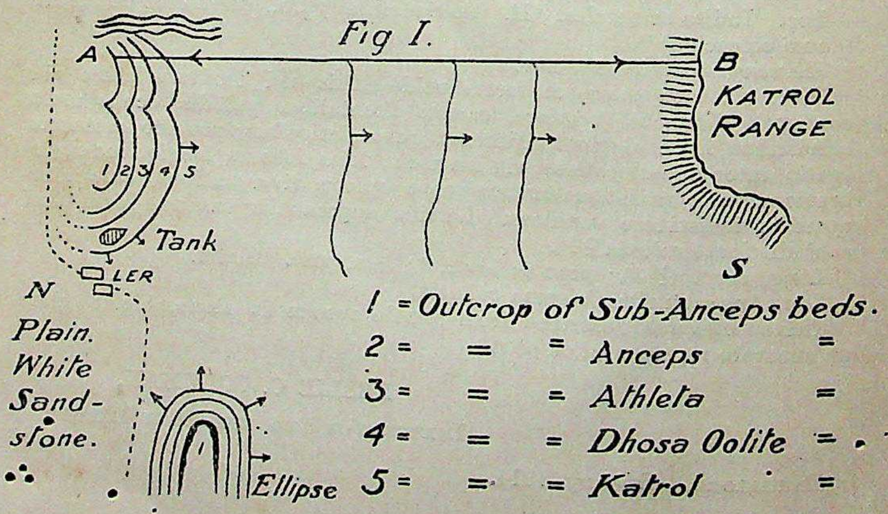
## No. XXXVIII.—NOTES ON CUTCH AMMONITES.

### No. V.

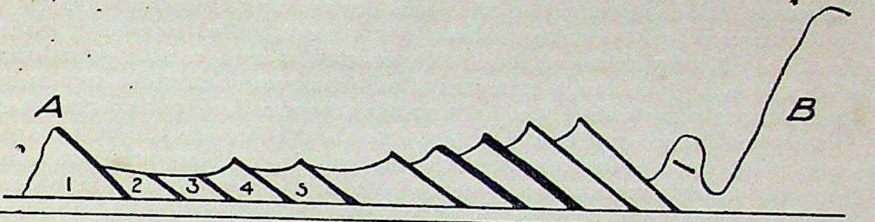
### East of Ler.

In No. IV, while describing the East curve of the Ler-Hamundra Ellipse, I mentioned the fact that the outcrop of the Katrol-to-Anceps beds swings round to the East, dipping outwards for a short distance only to rise again as the flanking of another Ellipse to the East of Ler. I propose to sketch the ground just East and South-East of Ler in this latter-ground which though small in extent produces an enormous quantity of specimens well worth study.

This diagram shows how the ground lies:—



and this shows a general idea of the section A to B:—



Section from A to B. (rough) Fig II.

The high Katrol range backs the scene, lying a mile or more behind A and a long succession of jutting ledges of outcrops—hollowed here and there into deep depressions—leads you down steadily to the dark brown rocks of the lower Katrol strata, next to which you step on to the low yellowish D. O. ridge, whence a long flat slopeover soft Athleta and anceps beds brings you to the hard slabs of the Sub-Anceps beds which have proved less susceptible to weathering and rise in a slope to some 60 feet overlooking the plain.

An examination of the lie of the strata shows that the beds on the West of the hill near Ler dip outwards. Whether they curve right round along the North side, I cannot say: any how the surface shows that they spread out for some distance North-West of the hill before the white sandstone of the plain is encountered: and there are plenty of slabs of Anceps-crimson (marbled with shells) to be found on the fields North of the hills. So I am inclined to believe that here again you have a full anticline which if faulted at all is not faulted along the crest of the hills.

Just North-East of the point A, there are quarries of white grey stone which is not usual along this range: it may be a deposit of the Sub-Recent Concrete which the Revd. J. F. Blake described in the Q. J., Geol. Soc., May 1897, attributing its formation to the agency of wind.

Now as to the contents of the ground sketched. The inside of the hollow tooth of the two Sub-Anceps hills has just under the crimson-brown rocks of its shell a layer of what I call false conglomerate—a dense yellowish pavement with broad flat round-edged concretions of bulb crimson, and white ingrained. This bed is fairly constant also along the Ler-Hamundra Ellipse and the vanguard ridges of the Fahirwadi belt. It contains several belemnites—too cracked or broken for identification: also *Ostræa* and *Cucullæa*. But so far I have not picked up any ammonites on these two Sub-Anceps Ler Hills.

The Anceps beds lying in the long broad hollow below (South of) the hills, produce a thin flat very-evolute *Perisphinctes*, akin to *Balinensis*, I should judge, a fairly perfect specimen. A similar one I found in the Sub-Anceps beds of the Ler-Hamundra Ellipse; and also another in Athleta beds along Fakirwadi. I cannot find any of Waagen's specimens which agree with these. *Perisph. obtusicosta* also appears: two specimens of what might be *angygaster* except for width of umbilicus, and a smaller specimen of the Obtusicostati subgenus. Of this class I may here say that Athleta and Anceps beds produce very numerous specimens, many in excellent preservation. Some may be Waagen's *omphaloder* or *dhosaensis* or *angygaster*; but the great majority clearly differ. In some in which the suture is visible the auxiliaries do *not* trend largely apicad as in Waagen's *obtusicosta* and *angygaster* but run down fairly straight; yet in ornament they agree only with Waagen's Obtusicostati sub-genus. Some have, earpieces at the mouth which appear to run straight, not inclined up or down as in Waagen's *omphalodes* and *dhosaensis*. There are so many of these specimens findable and the differences are so marked that a monograph might well be written on them alone. I rather gather that this sub-genus (or section) of *Perisphinctes* has been differentiated off into a new genus since Waagen's day; but any ammonitist who may read this with any interest will probably know the style of ammonite to which I refer. Some are depressed, some compressed; ribs number about 15 in the 4th whorl, and are broad and rounded; some have branch ribs running straight, some curved forwards more or less strongly; some are more involute than others. In these same beds occurred a specimen of what looked like Waagen's *Oppelia orientalis*.

The D. O. beds bear much the same appearance as that of the same beds along Fakirwadi, Bharasar and Samatra, but the tilt being slighter, less of the slab surface is exposed and the scarp is not so high. Still here one could notice the fairly frequent occurrence of *Perisph. Rota*—too much engrained in the rock for extrication and certain identification. A new *Perisphinctes* of similar pattern and shape, but of much denser and finer ribbing turned up in good preservation. The mouth piece seems approaching the uncoiling stage of decline. The section is not high enough to class it with Waagen's *Obliqueplicatus*. Again these beds produce good specimens of *Stephanoceras*. One looks much like Waagen's illustration of *Steph. polyphemus*, except that its section is not so squarish. In Dr. Noëtling's work on the Fauna of Mazar Drik in Beluchistan, we find that the original of Waagen's larger *polyphemus* has disappeared: and Dr. Noetling hopes that some equivalent of it may turn up. I daresay this is an equivalent but its lobes are not visible. Its diameter is 237 mm. Another *Stephanoceras* of flattened globular shape reminds one of *tumidum* but has quite a different suture. An *Aspidoceras* with clean double row of tubercles on high ribs reminds one of *Babeanum* or *Athleta*. Its shape is more like *Babeanum*: its suture more like *Athleta*: but the inner whorls are blocked. The discovery of an *Oppelia* from the D. O. beds close to the *polyphemus* (?) was of much interest. Oppeliæ of the *Trachynota* group abound in Katrol beds close above D. O.: but D. O. is very reticent about their ancestors. Hence the interest: however the specimen was very fragile and broke up too easily: the fragments show (or seem to show) a clear inner half of the whorl: outer half with regular evenly-sized low rounded ribs ending in tubercles on the siphonal edge.

But the Katrol beds are the distinctive feature here. 150 yards South-East of the tank you will strike a shallow nullah running West along the Katrol lines. It is a marvel of wealth. Every step you take you 'll see the outer casts or fragments or protruding edges of some of Waagen's sub-genus of *Perisph. evoluti*. From reading Dr. Uhlig's book on the Spiti shales I conclude that classfication has somewhat changed since Waagen wrote: but here is an excellent field for studying the Cutch varieties of the Virgatosphinct and Aulacosphinct sub-genera. Most specimens picked up seem to belong to Waagen's *bathyplocus* and *torquatus* types. I see that it is now recognized that Waagen's *torquatus* is not the same as Sowerby's; but as no new name has yet (it seems) been given to Waagen's, I must still call it by that name. However the specimens are so numerous and the divergences so minute that I cannot feel sure of having certified any: nor can one certify any without comparison with the type. Waagen was not able to give the sutures of any of those four similar sorts, *bathyplocus*, *torquatus*, *katrolensis* and *pottingeri*. The hard brown rock of which these Ler specimens is composed shows up the suture of many quite clearly. The lines are very similar to those of Uhlig's *Virgato sphinctes*, the auxiliaries forming a more or less long sutural lobe; but in most cases, the development of the second lateral is not interfered with by the exuberance of the auxiliaries. In some cases (of specimens which look like brothers) there is a difference, in that the 2nd auxiliary sometimes crosses the apex of the 2nd Lateral, sometimes does not. *Pottingeri* which is fairly common along Fakirwadi seems at a discount here. *Katrolensis* there is: also some other species which I can not identify with Waagen's: one may be *bleicheri*: it agrees in every point except with the high and sharp ribs named by Waagen: some may be *Chloroolithicus.* Several look much like Uhlig's *biplicatus,* except that the height of the last whorl is not pronounced enough. One half specimen looks very much like Uhlig's *Per. smith-woodwardi.* The cleancut Virgatosphinct ribs are few and only on the body chamber: but they are clean and decided: and moreover the ribs of both sides do not always *correspond* with the ribs on the other flank, as seems to be the case in Uhlig's back view of *smith-woodwardi.* (This non-correspondence of ribs is a very common feature of these Katrol specimens). But the specimen has the inner whorls mostly blocked by hard iron stone. The section shows great similarity in the development of the shape of the whorls. Other Katrol specimens are much like *Tibetanus* of Spiti, but are not *Aulacosphinct.*

I must leave the other peculiar specimens of that class. Description is of not much use. All I want to do is to induce some Ammonitologist to become interested.

A *Lytoceras* must be named. Its striæ, though thicker or more elevated in some places than in others, have *no* cremulations: but only the body chamber is visible: inner whorls if extricable might be interesting. *Phylloceras mediterraneum* (or what seems to be that) is also here. I have now some 10 specimens of this from Katrol beds, Waagen's were found much lower. There is also a worn half specimen of *Phyll. disputabile*: its lopes agree with Waagen's illustration of *disputabile's* lopes: it is not *lodaiense.* Waagen's *disputabile* came from Macrocephalus beds where I have also found them. There is also an *Aspidoceras* like *binodiferum* but with differing suture. *Oppeliæ* of the *Trachynota* group are not infrequent.

The layers of rock teeming with Ammonites die out very soon. I doubt if here they are more than 50 feet deep: near the Barapur Road (Fakirwadi Ridge) they extend for perhaps 300 feet of depth. The cold brown and red supervene and produce practically nil. I stalked across the ladder like outcrops for a mile up to the foot of the high range. That the rocks were marine was still evident for a rare belemnite here and there showed it; on one ridge perhaps 100 feet above the rich vein. I found an ammonite of, I think, the Evoluti with very early trichotone sharp ribs and at the foot of the high hill the fragment of another Evoluti. The outer cast of an *Aspidoceras* like *Subdistractum*—with very long spines I had found previously somewhere about the middle of this ridge ladder.

What with the multitude of forms not yet recorded from Cutch, and with the alterations which seem to be now necessary in Waagen's work (*e.g., Polyphemus, Torquatus, Frequens*) and with the Spiti specimens available for comparison, it does not seem out of place to urge a fresh examination of the Cutch ammonites. If a member or a friend of the Society would take it up, there would be a fresh feather to plant in the Society's cap.

J. H. SMITH.

BHUJ, *25th January* 1914.

# PROCEEDINGS

## OF THE MEETING HELD ON THE 16TH APRIL 1914.

At the "At Home" of the Bombay Natural History Society took place on the 16th April 1914, a number of specimens recently received from Lower Tenasserim in connection with the Mammal Survey of India, Burma and Ceylon were on view.

The election of the following 28 members since the last meeting was announced:—Mr. R. Spearman Armstrong, Colombo; Lt. L. H. Brunlees, Lahore; Lt. R. A. Savory, Lahore; Count E. Hoyos, Austria; Mr. F. W. Bakewell, Colombo; Major E. C. G. Maddock, I.M.S., Ahmednagar; Mr. C. G. Adams, I.C.S., Ahmednagar; Mr. E. Battiscombe, Nairobi; Hon. Mr. John Ross F. Lowis, Bettiah, B. & N. W. Ry.; Mr. G. L. Corbet, I.C.S., Saugor, C.P.; Capt. R. F. D. MacGregor, I.M.S., Bombay; Capt. R. Foster, Mussoorie; Lt. R. S. Wahab, I.A., Bangalore; Mr. N. Roy, Dacca; Mr. Syed Mahdi Hassan, England; Mr. R. R. MacFadden, Bilaspur, B. N. Ry.; Miss Pogson, Kotgarh, *via* Simla; Mr. J. W. Anderson, Rangoon; The Administrator, Porbandar State, Porbandar; Mr. Duncan Fraser, Bombay; Mr. Hector Menezes, Bombay; Major G. Knowles, Saugor, C.P.; Mr. John Still, Kandy, Ceylon; Mr. J. Morgan, Calcutta; Mess President, 86th Carnatic Infy., St. Thomas Mount; Mr. H. Trotter, I.F.S., Burma; Mr. A. R. S. Macklin, I.C.S., Hyderabad, Sind; The Diwan of Cochin, Trichur, S.I.

The Honorary Secretary acknowledged the following contributions to the Museum since the last meeting:—

| Contribution. | Locality. | Donor. |
|---|---|---|
| Nest of a Trap Door Spider and several other spiders in spirit<br>5 Snakes<br>Several Mammals and a number of birds' nests. | Burma | Capt. F. E. W. Venning. |
| 155 specimens of Bees and Wasps | Various | Mr. E. Comber. |
| 4 legged Chicken and Skin and Skull of Yak. | Kurseong | Mr. A. Wright. |
| 6 Gulls | Colaba | Mr. S. H. Prater. |
| 3 Snakes<br>2 Scorpions | S. Kanara | Mr. A. P. Kinloch. |
| Skin and Skull of Woolly Wolf, European Wolf, Macaque and Imperial Sandgrouse. | Chitral | Capt. H. F. D. Stirling. |
| Head of Suleman Markhor | Malakhand | Major R. L. Kennion. |
| 2 Masks of Kashmir Stag<br>6 Flying Squirrels and some Bats in spirit. | Chakrata | Major H. Fulton. |
| Anderson's Hedgehog | Jhelum District | Mr. F. J. Mitchell. |
| Stoliczka's Hedgehog | Karachi | Mr. T. M. S. Culbertson. |

| Contribution. | Locality. | Donor. |
|---|---|---|
| 3 Skins of four Horned Antelope | Chikalda District. | Mr. A. A. Dunbar Brander. |
| 1 Giant Squirrel | Upper Burma | Mr. F. C. Purkis. |
| 1 Falcated Teal and Dark Grey Bush Chat. | Burma | Mr. C. Hopwood. |
| 2 Flying Lizards (alive) | Malabar | Mrs. Barrett. |
| 2 Sambar | Burma | Mr. T. A. Hauxwell. |
| 1 Thamin | | |
| 1 Gaur | | |
| 1 Sinaitic Ibex | Sinai | Maj. A. G. Gardyne. |
| 1 Common Indian Civet | Singapore | Mr. H. E. Standage. |
| Skin of Flying Squirrel | Gyantse | Capt. F. M. Bailey. |
| 6 Birds | Saran | Mr. M.M. Mackenzie. |
| 2 Assam Giant Squirrels | Aka Hills | Capt. R. S. Kennedy, I.M.S. |
| 1 Striped Squirrel | | |
| 1 Marten | | |
| 1 Bat | | |
| 9 Birds | | |
| 15 Birds | Burma | Mr. C. E. Milner. |

Minor contributions from Messrs. H. M. Dwane, E. H. Dwane, J. P. Bradshaw, C. E. Aitken, J. Counsell and Capt. W. M. Logan Home.

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